WALTER F. WELLS, PRESIDENT

National
Electric Light Association

Forty-Second Convention

Commercial Section Sessions

PAPERS, REPORTS and DISCUSSIONS

Atlantic City, N J
May 19-22, 1919

Published by Order of the Executive Committee

Prof. A. E. Kennelly
Cambridge

PRINTED BY
CHARLES FRANCIS PRESS
NEW YORK, N. Y.

COMMERCIAL SECTION

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INDEX TO AUTHORS

BARTLETT, E J *Electric Trucks and Tractors and their Relation to the Central Station Load*

The major classifications of this paper are as follows: Present Manufacturing Capacity, Industrial Vehicle Work, The Volume of Business Involved, Charging Current Required, and Central Station Influence.

In addition to these classifications, the introduction explains the types and their respective names.

Under "Manufacturing Capacity" are presented possibilities of the general data regarding the truck and tractor, as well as what the manufacture of these means to the battery and charging apparatus makers.

Under the heading of "Industrial Vehicle Work" an outline has been given of the types and their respective uses.

The paragraph devoted to "The Volume of Business Involved" approximates the number in use and the possibilities.

Under "Charging Current Required" are listed battery equipments of the various types and a statement as to what the use of Tractors and Trucks means financially to the central station.

In the "Central Station Influence" paragraph suggestions are made as to the best plans for central stations to utilize in securing this very excellent and profitable business.

The purpose of the paper is to awaken to the wonderful possibilities awaiting the rapid development of the Industrial Tractor and Truck all those who naturally should be interested, especially the central stations. 394

BONSALL, R F *Report of Committee on Commercial Service and Relations with Customers*

This report deals with the practice of various companies in regard to applications, credits, meter reading, collections and complaints, including some recommendations by the Committee.

A questionnaire was sent to seventy-five companies in various sections of the country, and replies were received from thirty-eight. The questions were designed to show (1) The value of a customer's signature; (2) The advantage of leaving service available on vacant premises; (3) The use of telephone and mail requests for service, and the length of time required to connect service.

Credits also are considered, the method of obtaining credit data, when to require a deposit, when to return it, and exchange of credit information between companies.

Meter reading in its details is tabulated, methods of entering customers' premises, use of meter readers during spare time, connections found ahead of meters, etc.

Collections are considered, the handling of current and delinquent accounts and the practice of disconnecting for non-payment.

Complaints are discussed, the adjustment of bills, including grounded and unaccounted for use of service and investigation on customers' premises.

The answers show such a wide difference in methods among the members that your Committee recommends the continuation of effort to bring about greater uniformity in our commercial relations with customers. The result of such effort may be at least the nucleus of a handbook on standard practice in this department. 12

The report is divided into the following sections:

1. Standardization of Plugs and Receptacles (Socket end of the cord). No report.

2. Standardization of Appliance Plugs and Housing (Appliance End of the Cord). Progress. There is a plug on the market available for use on both flat and round prongs which, if it turns out to be a commercial success, will solve the problem.

3. Polarity Plugs and Receptacles. Watchful waiting, with a recommendation that nothing be done that would interfere with the use of the millions of flat-irons and other devices now operated by our customers.

4. Standardization of the Portable Cord. The Committee believes that a minimum standard of quality should be arrived at by experience, but that any other standardization would be harmful.

5. Standardization of Range Connection to Wiring. The Committee believes that any rules on this subject would be harmful. Any safe method should be permitted.

6. Fires from Flat-Irons, Immersion Heater Elements and Similar Devices. The Committee recognizes that fires sometimes occur from careless use of these appliances, and recommends continued education of the public against carelessness.

7. Concentric Wiring and Other Methods of Wiring. The Committee continues to report that many of these methods have been proved safe, but are still practically forbidden in this country by interests over which the Committee has no control. The Committee considers the situation very unsatisfactory, and disadvantageous to the interests of our customers, the public.

8. Solid Neutral. The Committee continues to report that the solid neutral from the generator or transformer to the lamp would be not only cheaper but safer for our customers.

9. Color of Neutral Wire. Final action on the Committee's recommendation in favor of a distinct color for the neutral or grounded wire has been postponed on account of the war. The Committee hopes it will soon go into effect.

10. Size of Wire. The Committee recommends that No. 18 and No. 16 wire should be *permitted* when they are safely protected, as well as when they are exposed to mechanical injury. There will be but few cases where this will make any appreciable saving: the chief object of this section of our report is to bring out the fact that when a code for protection against fire or life hazard is made use of to promote other objects, then the result is not increased safety, but instead is increased danger.

11. Connection Between Inside Wiring and Outside Lines. The Committee has under consideration what should be done on this subject beyond its 1917 report, and will make a recommendation to next year's Committee as to further study of this subject.

12. National Electrical Code. The Committee presents a discussion and hopes that the result may be that in the future the Code and its makers will devote more attention to the introduction of new and safe methods. Since rules for wiring were established, the costs of generating and of distributing electricity have been steadily reduced to a fraction of their former amount; but the cost of wiring has, if anything, increased. The Committee believes that if wiring rules had permitted and encouraged more development, the result would have been a reduction in wiring costs without any reduction of safety, similar to the reduction in generating and distributing costs that have made possible the growth of our business, and have given such great service to the public.

13. Tests of Wiring. The Committee believes in basing all rules on experience and tests, and is arranging to record the experience and tests on different methods of wiring at different ages. These records will indicate the items on which data are lacking; and the tests being made under the auspices of the Committee, together with such other records as it may be able to present, will in time cover a large field. The third appendix to the report explains more fully the plans for the reporting of the tests. The other two appendices give some very valuable data on rubber-covered vs. slow-burning wire. 29

During the past two years, notwithstanding the abnormal business conditions, your Committee has considered it necessary to continue the courses in Commercial Engineering and Practical Electricity, and has maintained them on a self-supporting basis.

Member companies and their employees showed a renewed interest after the ending of the war, indicating that they considered them of value during the present reconstruction period.

In conducting a campaign starting February 1st, the Committees of the Commercial and Accounting Sections combined and divided the territory among a larger number of committeemen, reducing the cost to both Sections on special campaign literature, such as posters, pay envelope slips, etc. Where the companies have used these pay envelope slips, the results have been very satisfactory and it would appear that if the member companies would adopt this cooperative method the courses would receive the support to which they are entitled.

It is recommended that a similar campaign be conducted next September, combining both Commercial and Accounting Section Committees on Education. 81

The value of residence lighting business can be materially enhanced to the central station through more thorough saturation and through the sale of more energy to present consumers.

This has been the thought of the Committee in preparing the report submitted.

Owing to the uncertain conditions prevailing during the past year, the central station companies were unable to solicit new consumers. During the fuel shortage, lighting restrictions tended to re-

GENERAL INDEX

COMMERCIAL SECTION PROCEEDINGS PAPERS AND REPORTS OF THE FORTY-SECOND CONVENTION, 1919

NOTE—In the Index to Authors will be found authors' names and synopses of papers and reports.

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CONVENTIONS OF THE ASSOCIATION

1st	Chicago, Feb 25-26, 1885	James F Morrison
2nd	New York, Aug 18-20, 1885	James F Morrison
3rd	Baltimore, Feb 10-12, 1886	James F Morrison
4th	Detroit, Aug 31-Sept 2, 1886	James F Morrison
5th	Philadelphia, Feb 15-17, 1887	James F Morrison
6th	Boston, Aug 9-11, 1887	James F Morrison
7th	Pittsburgh, Feb 21-23, 1888	James F Morrison
8th	New York, Aug 29-31, 1888	Samuel A Duncan
9th	Chicago, Feb 19-21, 1889	Samuel A Duncan
10th	Niagara Falls, Aug 6-8, 1889	Edwin R Weeks
11th	Kansas City, Feb 11-14, 1890	Edwin R Weeks
12th	Cape May, Aug 19-21, 1890	Marsden J Perry
13th	Providence, Feb 17-19, 1891	Marsden J Perry
14th	Montreal, Sept 7-10, 1891	Charles R Huntley
15th	Buffalo, Feb 23-25, 1892	Charles R Huntley
16th	St. Louis, Feb 28-Mar 2, 1893	James I Ayer
17th	Washington, Feb 27-Mar 2, 1894	Edward A Armstrong
18th	Cleveland, Feb 19-21, 1895	M Judson Francisco
19th	New York, May 5-9, 1896	C H Wilmerding
20th	Niagara Falls, June 8-10, 1897	Frederic Nicholls
21st	Chicago, June 7-9, 1898	Samuel Insull
22nd	New York, May 23-25, 1899	Alden M Young
23rd	Chicago, May 22-24, 1900	Samuel T Carnes
24th	Niagara Falls, May 21-23, 1901	James Blake Cahoon
25th	Cincinnati, May 20-22, 1902	Henry L Doherty
26th	Chicago, May 26-28, 1903	Louis A Ferguson
27th	Boston, May 24-26, 1904	Charles L Edgar
28th	Denver-Colorado Springs, June 6-11, 1905	Ernest H Davis
29th	Atlantic City, June 5-8, 1906	William H Blood, Jr.
30th	Washington, June 4-8, 1907	Arthur Williams
31st	Chicago, May 19-22, 1908	Dudley Farrand
32nd	Atlantic City, June 1-4, 1909	William C L Eglin
33rd	St. Louis, May 23-27, 1910	Frank W Frueauff
34th	New York, May 29-June 2, 1911	W W Freeman
35th	Seattle, June 10-14, 1912	John F Gilchrist
36th	Chicago, June 2-6, 1913	Frank M Tait
37th	Philadelphia, June 1-5, 1914	Joseph B McCall
38th	San Francisco, June 7-11, 1915	Holton H Scott
39th	Chicago, May 22-26, 1916	Edward W Lloyd
40th	New York City, May 9-10, 1917	Herbert A Wagner
41st	Atlantic City, June 13-14, 1918	John W Lieb
42nd	Atlantic City, May 19-22, 1919	Walter F Wells

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W H Rolinson
J H Ross
C W Ruprecht
W R Sammons
John V Strange
J A Summers

Electrical Advertising

E A Mills, Chairman
The New York Edison Company, New York City

H I Markham, Vice-Chairman
Federal Sign System (Electric), Chicago, Ill.

R P Burrows
L R Crawford
C A Dean
C J Eaton
R E Harrington
E R Kelsey
W H McBride
W H McIntyre
J C McQuiston
Earle L Milliken
F H Murphy
L H Newbert
E S Pelling
Elliott Reid
W R Sammons

Com.

Industrial Lighting

William A Durgin, Chairman
Commonwealth Edison Company, Chicago, Ill.

F O Broili
G T Dunklin
R B Ely
F L Frizzel
W H Hamilton
M H Hendee
J T Huntington
O L Johnson
W H McBride
C A Mau
F H Murphy
L F Riegel
J W Ruff
W R Sammons
J L Stair
H D Stokes
F C Taylor
G B Walker

Lighting of Public Buildings

G Bertram Regar, Chairman
The Philadelphia Electric Company, Philadelphia, Pa.
Ward Harrison, Vice-Chairman
National Lamp Works of General Electric Co., Cleveland, Ohio

M T Blackwell
H A Brooks
F A Gallagher
O R Hogue
C L Law
W H McBride
A B Oday
J L Stair
C S Walton

Outdoor Lighting

H H Magdsick, Vice-Chairman
National Lamp Works of General Electric Co., Cleveland, Ohio

N R Birge
D K Chadbourne
C A B Halvorson
H W Korhammer
W G Marthai
W Reed
Elliott Reid
William A Root
J L Stair
C J Van Gieson

Possible Causes of Decrease in Revenue and Suggestions for Remedying Such Conditions

George Williams, Chairman
H. L. Doherty & Co., New York City
L C Spake, Vice-Chairman
Electrical World, New York City

F W Boldenweck
George B Foster
H J Gille
Thomas F Kennedy
A C McMicken
H N McConnell
A K Young

Residence Lighting

C W Johnson, Chairman
Hodenpyl, Hardy & Co., Jackson, Mich.
Edwin Mandeville, Vice-Chairman
Worcester Electric Light Company, Worcester, Mass.

C M Benedict
J C Chestnut
W B Christie
Charles A Collier
J F Derge
S C Dowling
C J Eaton
Robert B Ely
F A Gallagher
John S Hogan
A E Lennox
Lewis A Lewis
W A McKay
F H Murphy
Fred H Scheel
J H Slade
H T Spaulding
F C Taylor
G W Uzzell
George H Watson
A B Wollaber

Store Lighting

A L Powell, Vice-Chairman
Edison Lamp Works, Harrison, N. J.

Charles T Barnes
E Mandeville
H T Spaulding

POWER SALES BUREAU

George H Jones, Chairman
Commonwealth Edison Company, Chicago, Ill.

C H Stevens, Vice-Chairman
Leslie, Stevens Company, New York City

H H Holding, Secretary
Public Service Electric Company, Newark, N. J.

EXECUTIVE COMMITTEE
Officers and

F W Boldenweck
E L Crosby
J M Curtin
M C Gilman
O R Hogue
C A Kelsey
M G Kennedy
R H Knowlton
I Lundgaard
E S Mansfield
Charles J Russell
Sidney G Vigo
N T Wilcox
E L Wilder

ORGANIZATION OF WORK

Electro-Chemical Division

Chas J Russell, Chairman
Philadelphia Electric Company, Philadelphia, Pa.

General Power Division

R H Knowlton, Chairman
United Gas Improvement Company, Philadelphia, Pa.

Industrial Electric Heating Division

E L Crosby, Chairman
Detroit Electric Furnace Company, Detroit, Mich.

Isolated Plant Division

I Lundgaard, Chairman
Rochester Railway & Light Company, Rochester, N. Y.

ELECTRIC VEHICLE SECTION

Officers, 1918-1919

E S Mansfield, Chairman
The Edison Electric Illuminating Company of Boston, Boston, Mass.

George B Foster, Vice-Chairman
The Commonwealth Edison Company, Chicago, Ill.

H M Edwards, Treasurer
The New York Edison Company, New York City

A Jackson Marshall, Secretary
N.E.L.A. Headquarters, New York City

EXECUTIVE COMMITTEE
Officers and

Charles Blizard
E P Chalfant
Gaylord A Freeman
Frank W Frueauff
Walter H Johnson
T I Jones
James H McGraw
Frank W Smith
H G Thompson
Charles A Ward
E R Whitney
Arthur Williams

STANDING COMMITTEES

Federal and Municipal Transportation

JAMES H MCGRAW, Chairman
McGraw Publishing Company, New York City

FRANK W SMITH, Vice-Chairman
The United Electric Light & Power Company, New York City

F M FRIKER — C M MARSH — C A WARD
W P KENNEDY — C A STREET — E R WHITNEY

Garage and Rates

C H MILES, Chairman
The Edison Electric Illuminating Company of Boston, Boston, Mass.

E P CHALFANT
HENRY HARRIS
GEORGE H JONES
BERNARD LESTER
C M MARSH
C H MEEKER
WALTER NEUMULLER
HARRY SALVAT
F F SAMPSON
WILLIS M THAYER

Insurance

DAY BAKER, Chairman
41 Ferdinand Street, Boston, Mass.

W H BLOOD, JR, Vice-Chairman
Stone & Webster, Boston, Mass.

A H MANWARING — C A WARD

Legislation

G A FREEMAN, Chairman
Walker Vehicle Company, Chicago, Ill.

CHARLES BLIZARD — FRANK W SMITH — H G THOMPSON
E P CHALFANT — FRANK J STONE — C A WARD

Manufacturers and Central Station Cooperation

GEORGE B FOSTER, Chairman
Commonwealth Edison Company, Chicago, Ill.

C A WARD, Vice-Chairman
Ward Motor Vehicle Company, Mt. Vernon, N. Y.

W H ATKINS — G A FREEMAN — C E MICHEL
J M BROWN — W W FREEMAN — FRANK W SMITH
F NELSON CARLE — J D ISRAEL — CLARE N STANNARD
A C DOWNING — FRED M KIMBALL — MATHIAS TURNER
L A FERGUSON — F S KOMP — FRED R WHITE
W A FOX — JAMES H MCGRAW — E R WHITNEY

Membership

G A FREEMAN, Chairman
Walker Vehicle Company, Chicago, Ill.

I S HALL, Vice-Chairman
Charles H. Tenney & Co., Boston, Mass.

R S DUNNING
F C GIBSON
N B HAZELTINE
TALIAFERRO MILTON
C A OGDEN
J F ROGAN
H L SCHNEIDER
H A TEWKSBURY

Motion Picture Film

CARL H REED, Chairman
Electric Storage Battery Company, Philadelphia, Pa.

S W MENAFEE
F NELSON CARLE — GEORGE D SMITH — J M WAKEMAN

Standardization

E R Whitney, Chairman
Commercial Truck Company of America, Philadelphia, Pa.

E J Bartlett
H S Baldwin
Bruce Ford
H R Smith

Traffic and Good Roads

A C Downing, Chairman
Anderson Electric Car Company, Detroit, Mich.

Transportation Engineering Committee

F M Feiker, Chairman
The Electrical World, New York City

E J Bartlett
Charles Blizard
J B N Cardoza
C K Chapin
George B Foster
G A Freeman
Fred R Jenkins
E S Mansfield
A Jackson Marshall
Charles H Miles
H H Norris
Frank W Smith
George Drake Smith
Willis M Thayer
Charles A Ward
E R Whitney

TECHNICAL AND HYDRO-ELECTRIC SECTION

Officers, 1918-1919

R J McClelland, Chairman
Electric Bond and Share Company, New York City

H A Barre, Vice-Chairman
Southern California Edison Company, Los Angeles, Cal.

J E Davidson, Vice-Chairman
Nebraska Power Company, Omaha, Nebr.

J T Hutchings, Vice-Chairman
Rochester Railway & Light Co., Rochester, N. Y.

W C Anderson, Secretary
N.E.L.A. Headquarters, New York City

EXECUTIVE COMMITTEE

Officers, Committee Chairmen and

I E Moultrop
M R Bump
H H Scott
Thomas Sproule

STANDING COMMITTEES

Electrical Apparatus

R F Schuchardt, Chairman
Commonwealth Edison Company, Chicago, Ill.

H Carl Albrecht
R E Burger
H W Eales
L L Elden
H L Fullerton
S B Irelan
L M Klauber
G L Knight
A H Lawton
S J Lisberger
A S McDowell
A A Meyer
J F Neild
G E Quinan
E A Quinn
F E Ricketts
H H Rudd
N H Stahl
R H Tapscott
M O Troy
H L Wallau
W K Vanderpoel

Meters

F V Magalhaes, Chairman
The New York Edison Company, New York City

A S Albright
R M Boykin
F H Chamberlain
J S Cruikshank
B Currier
C G Durfee
Wm Eichert
C P Garman
F R Healy
C H Ingalls
C J Kellam
Otto Knopp
J C Langdell
M H Pittman
C O Poole
C J Theleen
A G Turnbull
Wm Volkmann
W L Wadsworth

Overhead Lines and Inductive Interference

A E Silver, Chairman
Electric Bond and Share Co., New York City

R L Baker
Markham Cheever
R D Coombs
A A Dion
E D Edmonston
John B Fisken
H B Gear
R H Halpenny
T F Johnson
T O Kennedy
J C Martin
W E Mitchell
W T Morrison
B E Morrow
C B Oliver
C S Ruffner
Thomas Sproulf
John B Taylor
W R Thompson
W K Vanderpoel
J E Woodridge

Prime Movers

N A Carle, Chairman
Public Service Electric Company, Newark, N. J.
R D DeWolfe, Sec'y

C M Allen
A D Bailey
E J Billings
W E Carter
R E Dillon
P M Downing
Louis Elliott
W W Erwin
J M Graves
H Harisberger
J B Klumpp
H P Liversidge
I E Moultrop
A J Macdougall
F D Nims
G W Saathoff
E H Tenney
O G Thurlow
J A Walls
John Wolff
H P Wood
R J C Wood

Underground Construction and Electrolysis

E B Meyer, Chairman
Public Service Electric Company, Newark, N. J.

H B Alverson
W H Cole
L L Elden
L A Herdt
F B Lewis
L T Merwin
A A Meyer
H N Muller
J B Noe
R C Powell
W E Richards
F E Ricketts
D W Roper
L S Streng

FORTY-SECOND CONVENTION
NATIONAL ELECTRIC LIGHT ASSOCIATION
FIRST COMMERCIAL SESSION

Tuesday, May 20, 1919

W. F. Wells, Chairman.

Charles J. Russell, Vice-Chairman.

The Chairman called the meeting to order at 2:10 p.m.

THE CHAIRMAN: My only function in opening this session. I believe, is to introduce your own Chairman, and it gives me great pleasure at this time to present to you Mr. Charles J. Russell, Chairman of the Commercial Section.

Mr. Russell then delivered the following address:

CONVENTION ADDRESS OF CHAIRMAN RUSSELL

The policy and activities of your representatives in the committees and bureaus of this Section during the present administration have conformed absolutely to the lines laid down in the report of Chairman Edkins to the Fortieth Convention, namely:

"In general, the policy of the Commercial Section, at least for the immediate future, will be to watch with greater care than ever the development of commercial work in all sections of the country; to study the best methods for developing intensive business to go on existing lines; to be on the alert for any and all opportunities which may present themselves for effective cooperation with the Association staff at headquarters and with other Association committees; to continue our committee work as far as possible by correspondence, avoiding all unnecessary expense, but collecting such data as will enable us to bring this year's reports up to date in case they are available for oral discussion at some later period; and finally to hold ourselves in readiness to assume any new burdens or duties which may be assigned to us by the incoming administration."

The continuation of this policy, the preservation of the organization and personnel of our committees and the quick response by these members to the call for renewed activities, enable us to discuss at this Convention our 1917 reports brought up to date.

In addition to the supplementary reports prepared for this Convention, recognition has been given to special topics of timely interest and importance. Papers and discussions have been arranged for on these topics, two of which will represent our contribution to the general sessions, the balance to be presented in our Section meetings.

The first of these covers one of the most vital questions of the day and is dealt with in the report of a special committee on "The Sale of Company Securities to Customers and Resident Citizens." The logic of seeking local capital for investment in public utilities which are essential to the progress and development of any given community is beyond dispute. The desirability of making every customer an investor in the utility which serves him is well understood. The relation of these facts to the present financial market is set forth in this report.

The second of these topics will be presented by Professor Joseph W. Richards, of Lehigh University, under the title "The Electro-Chemical Industries." War activities have brought electro-chemical and electro-metallurgical operations into new prominence, and the subject of developments of such character always of great interest to our industry, has especial importance at this time.

Power Sales Bureau

Associated with the topic just mentioned is the subject of the heating of metals in electric furnaces as a step in the various industrial processes of the metal trades. This subject was covered in the 1917 report of the Electric Heating Bureau and all those having occasion to seek information will find this report a *vade mecum.*

This country has taken tremendous strides in the development of electric furnaces within the past two years, now leading the world in the number of furnaces for the manufacture of electric steel. Our Power Sales Bureau has consequently arranged for a discussion upon the subject of electric furnaces for steel, as well as for a discussion upon the use of electric furnaces for the melting of non-ferrous metals. In the last-named field the melting of brass and other alloys offers a most promising opportunity for sales of electrical energy.

The subject of electric welding is receiving wide publicity at the present moment. It is of special importance in this industry on account of the problems of capacity, power factor, voltage disturbance and metering, as well as of the question of adequate rates for such service involved by the growing demand for this class of supply. All the phases of this subject will be dealt with at a session of the Power Sales Bureau.

The relation of electric industrial trucks and tractors to the central station load and the increasing importance of these adjuncts to the industries will be presented in a paper by Mr. E. J. Bartlett. This subject is also one which has been given great prominence through war activities, in which these aids to localized transportation have demonstrated their great value.

The extraordinary demands upon the central station industry or capacity to meet war needs and the difficulty of getting new apparatus or funds for financing plant additions have called especial attention to the effect of power factors below unity upon the utilization of our capital and facilities. The necessity of correcting low factors and of receiving proper compensation for kv-a., rather than kw., capacity is one of the most timely subjects in the industrial power field. Arrangements have been made to cover this subject in a paper and discussion at one of the sessions of the Power Sales Bureau.

The effect of the war on isolated plant costs is another topic which will be discussed by the Power Sales Bureau. The purchaser of such a plant is today confronted by the low power factor, if the term may be permitted, of a dollar. The operator of such a plant finds that every item entering into his maintenance and operation costs has increased from 35 to 100 per cent. This situation has changed materially the relation of competitive costs and is worthy of careful, sustained study.

Lighting Sales Bureau

The supplementary reports of the Lighting Sales Bureau Committees should receive most careful consideration at this time. While the value of electric light is more universally understood and esteemed than ever before, the natural effect of the various restrictions put upon illumination as a war measure has been to lower the standards considered satisfactory in pre-war times. The field for commercial effort toward higher standards of illumination is most important as a reconstruction measure.

Electrical advertising through signs, display and flood lighting, received a severe check to its progress during the war. The revival of display lighting should be given special consideration for the reason that it is of benefit not only to the customer and community but to our industry.

The reorganization of industry will demand higher standards of illumination than heretofore, both as a measure of safety and as an aid to production. The demonstration of Industrial Lighting Equipment by Mr. Wm. A. Durgin and the comprehensive exhibit arranged by the Lamp Committee and the Lighting Sales Bureau are of great interest and special importance at this time.

STANDING COMMITTEES

The report of the Committee on Commercial Service and Relations with Customers calls attention to the wide difference in methods of dealing with customers as far as commercial relations are concerned. It is universally recognized that one of our important reconstruction problems is the establishment of standards of commercial service as far as may be possible. The recommendation is made that this Section create a Bureau of Commercial Relations for further study and action along these lines.

The report of the Committee on Wiring presents the progress made in the study and discussion of a number of important subjects connected with standardization and safety, calling especial attention to the increasing importance of a reduction of wiring costs which are a decisive factor in the development of certain classes of business.

The report of the Committee on Education calls attention to the present necessity for these courses in the training and education of new employees, and recommends that a campaign be carried on next September with the object of their more universal adoption while we are building up our depleted commercial organizations.

The report of the Committee on Electrical Salesmen's Handbook calls attention to the suggestions presented in its 1917 report and urges that some immediate decision be reached as to the future policy of the Section in the matters of form and distribution of the Handbook as well as of reprinting and adding to this valuable publication.

The Electric Range Committee in its supplements to the 128 pages of reports submitted in 1917 calls attention to the consistent progress made in the introduction of these appliances during the past two years, in spite of restrictions, and also to the war developments and experiences in the preparation of food in large quantities. The effect of increased fuel costs on cooking is of special interest in considering the future of the electric range.

The report of the Publications Committee shows a quick response to the needs for publicity material on account of the resumption of commercial activities. The publication of 500,000 copies of the Christmas Folder, 200,000 of the House Wiring Booklet, and 500,000 copies of "The Right Way to Use Electrical Appliances" folder has been authorized. Other folders have been prepared and will be printed as conditions warrant.

A most important publicity plan has been suggested, and outlined in considerable detail, in the form of a series of illustrated educational advertisements for use by central stations locally, which tell, in an interesting and informative way, the story of what constitutes central station service, from the coal mine or water power to its application on the customer's premises. This "Publicity Campaign on Central Station Service" has excited very general interest and most favorable comment. The question of its authorization is now before the National Executive Committee.

The report of the Committee on Coordinate Advertising and Sales Campaigns calls attention to certain modifications in the schedules of the merchandising program presented in its 1917 report. The resumption of advertising and sales campaigns by manufacturers, central stations and allied interests gives opportunity to adopt the plan outlined in this report and thus gain the effect of simultaneous drives that concentrate the minds of the public on certain definite merchandise.

The report of the Merchandising Committee shows the careful consideration and cooperative spirit given to all phases of this committee's work. One of the outstanding features of our business during the war period has been the continuous demand for appliances of all kinds. The reasons are logical but the result is not confined to the merchandising sales benefits nor to the associated energy sales. The broader view of the result shows a growing appreciation of electric service and its possibilities—something that will have a tremendous cumulative value toward the development of our business as years go on.

General

This Convention finds us with our working organization practically complete as in 1916-17. The enthusiasm and loyalty of that organization have been amply proven in previous years and we shall find additional proofs of these sterling qualities as its work comes before us in the sessions here.

For two years we have marked time, as far as Section activities are concerned, and, from force of circumstances, our membership has been materially decreased.

During that period, however, our industry has advanced greatly in recognized importance and the volume of business done has expanded to a marked degree.

The reconstruction of commerce to maintain the present position of this country among the nations of the world will involve demands for power, heat, light and transportation in greatly increased volumes and of the most efficient character. The part we play in the industrial reconstruction will have as important an effect on the future of this country as our war activities had in the speedy termination of the war.

Put those facts together and you may deduce:

1st—That the coming administrative year looms large with the promise of opportunity and hard work.

2nd—That we must strengthen our organization and make sure of its adequacy to meet future demands.

3rd—That we must increase our membership and tie it in with our working organization.

4th—That we must accelerate—get ahead of the development of our industry.

Your retiring Chairman presents to his successor the following thoughts concerning these deductions:

1st—A survey of the work to be done at headquarters and the definition of the functions of those employees having to do with Section work seems a necessary step.

The possibility of subdividing, under the Chairman's direction, responsibility for the committee activities between the Vice-Chairmen seems worth considering.

2nd—Our present working organization is very flexible, but we should reach down into the activities of the Geographic and large Company Sections. It might also be strengthened by more members from and in the other National Sections.

Any increase in membership on committees should be made with a view of giving representation to all sections of the country along the lines just mentioned.

3rd—We should conduct active membership work through our own organization. New members need education as to the accumulated information available and our facilities for helping them in their work. This can best be called to their attention by members of our Committees in Geographic and Company Sections.

4th—We must start meetings and continue work straight through the year—get together on every possible occasion—make our committee meetings practically working conventions. The Lighting Sales and Power Sales Bureaus and the Merchandising Committee, main groups of our workers, should before fall present to our members, perhaps through the BULLETIN, all the information and data they can supply as to conditions, prospects, tendencies of business, etc., with any plans or suggestions they can make.

CONCLUSION

At the last Convention of this Association a most impressive resolution was adopted pledging to the United States Government our entire future as an Association and the future of our entire membership for the exigencies of the war, whatever they might be.

The history of our war activities will never be written nor will the story of the burdens carried by the utilities and of the sacrifices freely made by them ever be told in full.

We all know, however, that the spirit of that pledge has been fully exemplified in the conduct of this Section and of the members composing it.

I am sure that we also feel that, while the exigencies of the war have fortunately passed, we are still pledged as a Section and as individuals to our best collective and individual service in the reconstruction of industry and for the future of this country.

We are stronger and better men from all the experiences we have passed through and face the future with a full knowledge of the importance and obligations of our relation to the nation and to our industry.

We are, as a Section, indebted to the National officers and Executive Committee for their helpful attitude and support during the year. The staff at headquarters has taken a keen interest in all our activities and its assistance and suggestions have been greatly appreciated.

Mr. A. Jackson Marshall, our Executive Representative, is entitled to the gratitude of the entire Section for his efforts on our behalf, especially along the lines of publicity material.

And in conclusion I wish to thank each officer and member of the Section for their quick response to the call for renewed activities and for their loyal support and complete cooperation.

M. S. Seelman, Jr., Brooklyn, N. Y.: As one of the vice-chairmen of this Section, I have been asked by President Wells to announce the personnel of the committee appointed on the Chairman's address. The names are: Mr. E. A. Edkins of Chicago, Mr. J. F. Becker of New York, and Mr. T. I. Jones of Brooklyn, all past-chairmen of the Section.

Mr. Chairman, the meeting is now returned to your hands.

The Chairman (Charles J. Russell): The next business is the report of the Committee on Finance, John G. Learned of the Public Service Company of Northern Illinois, Chicago, chairman.

Mr. Learned: During the last administration the activities of the Commercial Section were justly limited on account of the war, and only after the signing of the armistice was the present administration warranted in releasing its pent-up energy.

The activities of the Commercial Section which involved expenditures were charges against appropriation authorized by the Executive Committee of the Association. Appended is a statement of the finances of the Section.

STATEMENT OF THE FINANCES OF THE COMMERCIAL SECTION

Appropriation approved Executive Committee meeting, January 10, 1919	$3,000
Appropriation approved Executive Committee meeting, April 4, 1919	14,000
	$17,000

	Appropriation	Appropriation Expended First Ten Months	Balance of Appropriation for Last Two Months
Committee on Education	$2,000.00	—	$2,000.00
Wiring Committee	600.00	$400.00	200.00
Lighting Sales Bureau	200.00	—	200.00
Power Sales Bureau	200.00	—	200.00
Christmas Booklet	6,500.00	—	6,500.00
House Wiring Booklet	3,750.00	—	3,750.00
Appliance Folder	2,375.00	—	2,375.00
Order Blanks, Letterheads, Mailing, etc.	1,375.00	—	1,375.00
	$17,000.00	$400.00	$16,600.00

$150.00 of appropriation and expenditure applicable to preceding year expenses.

MEMO.

The following contracts have been awarded:

200,000 copies "Electricity in Your Home," order blanks, price lists, etc.	$3,791.50
500,000 copies "Right Way to Use Appliances," order blanks, price lists, etc.	2,406.50
500,000 copies "Christmas Folders," order blanks, price lists, etc.	6,585.00
Total	$12,783.00

THE CHAIRMAN: Gentlemen, you have heard the report of the Finance Committee. Does anyone wish to ask any questions? I will be glad to entertain a motion for its adoption.

(On motion duly made, seconded and carried, the report of the Finance Committee was adopted.)

THE CHAIRMAN: The Chair will now appoint as a Nominating Committee to report at our last session on Thursday afternoon the nominations for the coming administrative year, Messrs. R. R. Young, E. W. Lloyd and Joseph F. Becker.

The next subject on the program is the report of the Committee on Commercial Service and Relations with Customers, R. F. Bonsall, the Consolidated Gas, Electric Light and Power Company of Baltimore, Chairman.

(Mr. Bonsall then read an abstract of the report.)

THE CHAIRMAN: Gentlemen, this important paper is now before you for discussion, and I am sure that we all realize the present importance of these questions. Who will lead in the discussion of this report? This is one of the livest topics of the day. Is there no discussion?

I would like to ask how many persons present have read this paper. Just raise your hands.

HENRY W. PECK, Schenectady, N. Y.: Mr. Chairman, I would like to suggest that the paper be read. I personally am interested in the subject; we all are, and having just come into the meeting I have had no chance to read it. I wanted to pay attention to the Chairman's address, and I did not want to read the paper while he was talking.

THE CHAIRMAN: The reason I was asking the question, it seems to me, Mr. Peck, that it is impossible for a paper like this to be discussed unless it has been read.

MR. PECK: Mr. Chairman, was the paper mailed out, or where do we get copies?

THE CHAIRMAN: Right at the entrance to this room. Now, gentlemen, if you will pay attention we will have this paper read by the Chairman of this important Committee, Mr. Bonsall.

REPORT OF COMMITTEE ON COMMERCIAL SERVICE AND RELATIONS WITH CUSTOMERS

Your Committee's report submitted in 1917 was the result of a questionnaire sent to some seventy-five companies, replies being received from thirty-eight. We feel that it is unnecessary to reprint this report even though it has not been discussed on the floor of a convention, as it was distributed shortly before the 1917 Convention and is contained in the bound proceedings for that year.

Your Committee is strongly of the opinion that the data presented in its last report will prove of unusual value to the member companies if studied in the light of their war experiences and their post-war problems. We recommend that the Association create a Bureau of Commercial Relations under the Commercial Section, so that men specializing in this class of work may have an opportunity for exchange of views and an intimate discussion of papers on these subjects.

The fundamental reason for this suggestion is that the chief duty of the men engaged in this work is the building up of that intangible asset *Good Will.*

This is true from the origin of the order for service to the closing of the account in the consumers' bookkeeping department. It continues through the monthly meter reading, billing and collection of the account, and the adjustment of complaints which arise from time to time.

These men each month, through their efficiency or otherwise, are adding to or destroying the structure of good will that is vital to the success of a utility.

Your Committee also suggests that member companies either organize a department to formulate and apply efficient methods of conducting relations with customers in the branches treated in this report, or form a committee composed of members of the various departments engaged in this work. Such a "good will" organization should be considered as a productive one and not a liability or expense.

Adequate service with fair and courteous treatment in this branch should receive as much consideration as the methods of generation and distribution of energy.

Manuscript of this report was received March twenty-seventh.

It is felt that to be responsible for the company's relations with its customers, those having charge should not be held jointly accountable for increase in new business or methods of accounting, and while it would not be necessary to create a special department in a company, such work would be more satisfactory to the public and the company if it were centralized, permitting customers to go to one point for information and satisfaction.

The customer gauges the intent of the company to serve him more by the treatment received upon each point of contact with the company than he does by the actual supply of energy to his equipment.

Therefore the proper training of the employees of such a department is requisite to good will.

Particular attention should also be given to the employment of clerks in this branch of service, with the view of securing men who with the experience gained in the company's work, would provide material from which the company could recruit for its higher positions. It is a recognized fact that we can attract the better grade of clerks for positions only if we can offer a direct line of promotion in appreciation of services rendered. Your Committee feels that such a personnel thoroughly educated in the general methods of the company and informed in advance of all advertising and campaigns, would pay large dividends in the good feeling brought about between the public and the utility.

The principal recommendations of the 1917 report will be found in the following resumé:

APPLICATIONS

It is recommended:

Where party is moving from one address to another, that application for service at new address read that it is in continuation of service at old location, thus making customer's service record continuous. This has great advantage from a collection standpoint. Signature of customer should not be required on such applications.

Where order is given over telephone, that the workmen completing order, obtain customer's signature to application. Where request is made by letter, the letter to be attached to application form, no other signature being required. Where company insists upon salesmen securing signature to application, service should be connected without waiting for receipt of said signed application.

That service be supplied where customer refuses to sign the regular form of application, provided the company has a schedule of rates on file with the Public Service Commission. The acceptance of service would be acceptance of terms and conditions of sale.

In the interest of quick service, that meters be permitted to remain connected on vacant premises for at least six months after former customer has terminated his account. This practice should be limited to small stores, residences and apartment houses. This will reduce at once the number of meters which must be set or removed, and thus eliminate just as many cases where customer might have to wait for service, inasmuch as the actual work would consist of man reading the meter. One large company in such cases uses a group of men who report to the Commercial Department, thereby materially reducing the time taken to execute the order, as well as expense. The cost of removal and subsequent installation will justify an extension of the period named, up to a point where it becomes a burden to carry the investment on inactive meters.

By keeping the meter sheet in meter hand book, the meter reader should be required to report on his regular trip those cases where premises are found occupied, but party has failed to notify the company. This is readily discernible by him if the sheet is properly designated to show that the account is inactive.

CREDIT

It is recommended:

That approval of application by Credit Department be made before meter is set or service actually connected, except where immediate action is necessary.

Where service is left on premises, credit information should be secured by the Credit Department.

Customers moving from one address to another should not be questioned as to credit. If the application is taken as a transfer, or as continuation of service at previous address, there should be no necessity of such applications passing through the Credit Department.

That a deposit be secured in those cases where existing customer's account is unsatisfactory.

That salesmen upon taking application, secure credit information.

That attention be given the method of securing credit information. The practice of companies very largely is to ask a number of questions, or to confine themselves to credit or mercantile agencies. New customers only should be questioned, and then to a minimum extent.

That a standard form be adopted for the exchange between companies of credit information on those customers moving from one city to another; under normal conditions service should be connected pending reply.

Where application for service is made in the same name as that of a person who owes a balance on discontinued account, that investigation be made before this account is placed on bill of customer at new address.

That deposits be returned on the initiative of the company after one year, provided customer's rating is good at that time. Deposit certificate should not be required in such cases, as endorsed refund check should be sufficient voucher.

That accrued interest be paid at time of refund of the deposit or annually on demand of the customer.

That it is unnecessary to compare the signature on application with signature on the receipt for refund of deposit, as the chances of forgery or misrepresentation are too slight to warrant the time taken up.

That the deposit together with interest be applied against the final bill, and a refund check for the difference together with receipted bill be sent to customer.

That guarantors be accepted in lieu of deposit only when guarantors are either property owners or have good credit rating.

That collection agencies be used only in extreme cases to collect unpaid accounts of customers leaving the city.

METER READING

It is recommended:

That special attention be given to the employment of a higher grade of meter reader, with a view of avoiding the experiences of the past year.

That meter readers be thoroughly trained in the reading of meter dials before being assigned to a route.

That consideration be given to the number of meters read per day, having in mind that we may be sacrificing accuracy for speed.

That meter readers do not enter premises unless admitted, except in basements of apartment houses, stores, etc.

That keys to premises closed during business hours be accepted, but precaution taken to prevent their unauthorized use.

That meter reading be given to customer upon request—in writing. Regular form should be used.

That meter reader be paid a fee for reporting any irregularity in customer's wiring, permitting unregistered use of current.

That the Commercial Department investigate any such reported irregularity in customer's wiring. If found to be the result of careless work, with no intent to defraud, that an estimated bill be rendered to cover the approximate use of service.

If found to be intentional, submit the facts to the Legal Department for final decision and action.

COLLECTIONS

It is recommended:

That two notices be sent to delinquent customers. The first should be a reminder that the bill is past due; the second should contain an expiration date, this second notice to be closely followed by visit of the collector to cut out the service if the bill is not paid.

Those habitually delinquent should be sent only one notice, containing the expiration date.

That only one call of the collector be made following sending of notice, except where second notice fails to cause payment of the bill. In such cases the second collector should cut out the service if he fails to collect.

That where part payment is offered, the collector should call the office for authority to accept it and leave the service on.

That no service be disconnected for non-payment of bills after 4 P. M. and none on Saturday or on day preceding a holiday.

That service be reconnected the same day bill is paid, when it is possible to do so during working hours, but not later than the following day in any event. Special cases should always receive special attention.

No charge should be made for reconnecting service except in those cases where it is necessary to disconnect service cable in the junction box of underground service, because of refusal of customer to admit company's representative.

That the Installation Department reconnect meters cut out for non-payment to insure that they will register correctly.

That weekly customers be transferred to monthly without their consent, when their rating improves. If, after notice, they object, continue account on weekly basis.

That monthly customers be transferred to weekly when account warrants it, if they refuse to make required deposit to protect the company from loss.

That temporary disconnections for non-payment should be made permanent and account closed if bill is not paid within ten days after the temporary disconnection.

That careful selection and training of men to handle delinquent accounts be considered by all companies, with a view of converting poor paying accounts into good ones.

That a special force of collectors handle the discontinued accounts, as persistence is often the only means of collection.

That form letters on Legal Department's stationery, be issued by the Collection Department in special cases.

COMPLAINTS

It is recommended:

That a separate department specialize in the investigation and adjustment of customers' complaints and general inquiries.

The employees of this department should be promoted from other branches of the company's work, after demonstrating their fitness to be entrusted with the duty of satisfying a customer.

They should be thoroughly tested in their knowledge of the company's policies, rates and methods, and should possess the ability to sell service.

The complaint should be given an individuality and justly investigated if the customer is to be convinced of the company's sincerity. The utter absence of any tendency toward a routine method of handling his complaint will materially aid in closing it.

That a centralized telephone board receive and answer all calls from customers regarding the supply of service, the amount of their bill or other miscellaneous information. Although this may at times require that this department consult the department affected, it is an assurance that the customer will receive better service. The conditions of the previous recommendation regarding adaptability of the clerks, apply here with equal force; in fact this board should be under the general direction of the superintendent of the service department.

That a more uniform method be established in the industry to cover the period of adjustment due to a fast meter.

This method should also consider the proper adjustment when meter is found creeping.

That when service is found grounded, an adjustment be made by allowing one-half of the excess amount of the bill, obtained by estimating a normal bill for the period, and adding to this one-half of the difference between it and the total amount of the bill.

That a liberal policy be pursued in those cases where an unaccounted for increase in the bill occurs, with no evidence of abnormal use or of service being grounded.

No adjustment should be made until every factor that might have influenced the amount of the bill has been considered. The customer, however, should be given the benefit of any doubt.

That a complaint of a high bill be investigated thoroughly through individualizing the case as referred to in detail in the first recommendation hereunder.

If the customer cannot be satisfied at the office, a representative of the same department specializing in service to the public should visit the premises to go into all of the conditions of use, arranging for test of the meter when necessary.

That meter be tested upon application of the customer, if after an impartial investigation he is not satisfied with the explanation made. It is preferable to satisfy a customer that meter registration is correct, rather than be bound to a definite schedule of test. Meters should be tested or changed without charge, at the request of the customer, even though test has recently been made.

That the industry give careful thought to the importance of acting promptly upon any complaint, as the psychological effect of quick action is recognized. This can be accomplished only by having a sufficient number of trained employees, some of whom may not be fully engaged at all times. Congestion and good service cannot mate.

That comparative data be obtained by the Committee to learn the reason for the wide difference in the daily average of complaints closed, per inspector, in the various companies.

That fuses be renewed without charge over the counter, when presented in a limited number. This practice should be restricted to residences, apartments and small stores.

Respectfully submitted,

R F BONSALL, *Chairman*

L A COLEMAN	F H PATTERSON
F F KELLOGG	HARRY M SIMKINS
L F MOWRY	C N STANNARD

HAROLD WRIGHT

THE CHAIRMAN: Now, gentlemen, the paper is properly before you for discussion.

MR. PECK: Having requested the reading of the paper, I feel in duty bound to say something about it. I feel we will be well repaid for hearing it discussed. Before discussing it generally, I want to make two suggestions to the Chairman of this Section, with the hope that he will recommend them to the President of the Association. One is that copies of papers be sent at least to all companies which send in an advance registration, putting it up to those companies to see to it that the men whom they expect to have attend the convention get the papers in which they are interested. It is unfortunate to waste a whole morning or afternoon listening to a very voluminous paper which can be read in advance, and yet you cannot get up and discuss a paper the contents of which you do not know.*

*As a measure of economy, the Chairmen of committees and authors of papers were requested to advise N.E.L.A. Headquarters as to the names of those men invited to participate in discussion, and to these, as well as members of the committees, copies of the printed papers and reports were sent in advance of the convention. Copies of all reports and papers were distributed at the sessions at which they were read. Obviously manuscripts received but shortly prior to the convention could not be made available in advance in printed form.

My second suggestion is regarding abstracts. With apologies to Mr. Bonsall, I do not consider the abstract of this paper amounts to very much. I read that very carefully but I had absolutely no knowledge which would permit me to discuss the paper upon the reading of the abstract. The paper itself is excellent; in my judgment, it is in effect an abstract of the subject.

I do not agree as a general proposition with the recommendation on page 14 that all meters be permitted to remain connected on vacant premises for at least six months. The conditions must certainly be taken into consideration. In some cases that is all right, in others, one month or two months is ample. To my judgment, two months as a general rule is a sufficiently long period.

In New York State we have among the companies a form of exchange of credit regarding customers who leave one city and go to another, and it has been found useful.

I do not believe that the return of the deposit at the end of one year is sufficient. We have found in our experience in Schenectady that customers who have been with us maybe a number of years will leave town without making any arrangements for closing their account, unless their deposit is in excess of the amount which they owe us when leaving. I believe that our losses would be very greatly increased did we not hold the deposit for a longer period.

I approve very strongly of the recommendation regarding the quality of our employees, as mentioned specifically under meter reading. We have engaged and are now engaging meter readers of a more expensive and higher class than we ever had in the past, believing that in all our contact with the customers, it is more important today than ever before to give the very best of service. There is an unrest at the present time, possibly a little stronger tendency towards municipal ownership than there has been in the past. That can be neutralized more by having a high grade of employee who meets the public than in any other way, and for many of our customers the meter reader is almost the only point of contact between customer and company.

In this connection, it is interesting to note that in the report which the Labor Department of New York State made last month, the highest average wage of the State in any classified industry was paid to the employees of the electric power industry.

I might mention that our practice in meter reading is to pay 1.3 cents per meter, with a deduction of ten cents per meter for all inaccuracies, and as a rule, our meter readers who read the most meters are also the most accurate.

Recently a member of our detective force took from one of our meter readers a skeleton key which we found to have been used to enter premises without proper authorization.

It is our practice to pay to meter readers or any other employee or any other person $5 as a reward for reporting to us any inaccuracy or any improper connection, taking service ahead of the meter or in tampering with the meter. Some members of the Police Department know that and have collected $5 from us at various times.

I do not believe under Collections, page 16, that those habitually delinquent should be treated any differently than others who are not habitually so. It means too much trouble for the collectors who handle them to separate those habitually delinquent from the rest. I should say give all of them the regular two notices.

We have found it desirable, and have had practically no objections from our customers—naturally they do object; we all object to paying money, if we can get out of it—to make a charge for reconnecting service after disconnection on account of non-payment of bills. We make a charge of one dollar, no matter how often it occurs.

I would like to ask the experience of the Committee or of others regarding the matter of furnishing service to another member of the family where the previous service had been disconnected for non-payment. Applications are sometimes made in different names, that of a son-in-law, for instance. Where we are satisfied that the one who is delinquent is going to use the service the same as before, we refuse to make the connection and so far have been able to maintain that stand.

I would like to ask also if any of you have charges for moving more than once a year. We have a great deal of moving around in Schenectady, more so, I believe, than in most places.

We made a test examination quite recently of several thousand accounts and found that something over 20 per cent moved within a period of twelve months. We found one case that moved six times in a year, many that moved three, four or five times a year. We are anticipating making a charge for transferring an account in less than twelve months' time, but have not yet put it into effect.

THE CHAIRMAN: Gentlemen, we are ready for the next discussion of this important paper.

M. C. EWING, Wausau, Wis.: Mr. Chairman, it was stated that cases in which wiring had been tampered with, with intent to steal electricity and defraud, should be referred to the Legal Department. What does the Committee, or anyone else, recommend that the Legal Department should do with them? Prosecute or not prosecute?

HENRY HARRIS, Pittsburgh, Pa.: The customer gauges the intent of the company more by the treatment received at each point of contact with the company than he does with his actual service.

To pay no interest on deposits, excepting on demand of the customer, is in my judgment very bad practice. If you are trying to establish a reputation for fair dealing, why, deal fairly. Do not make it necessary for the customer to make a demand for his interest, but pay that interest at certain stated times each year. If the company will pay interest annually on deposits as in the manner of savings banks, I think you will find less complaint on this entire question of deposits, if this deposit is forthcoming as freely as when on deposit in banks.

The percentage of losses due to uncollected accounts is very small. I think I am safe in saying that it will not exceed one-fifth of one per cent of the gross receipts. It seems to me that we could all afford to spend one-fifth of one per cent of our receipts from domestic business, rather than make a demand either for a cash deposit or for a statement upon which to base credit. The people find very little difficulty these days in opening accounts at grocery or department stores. Credit is very cheap, and I think the very fact that credit has been found to be cheap is one reason why the utility should be at least as reasonable in the establishment of credit for its service as ordinary merchandisers are.

The matter of paying the meter readers a fee for reporting any irregularity is, of course, open for discussion, but inasmuch as the Committee recommends that we employ a higher grade of men for meter readers, I think that recommendation would solve the problem. Our own experience has been that without any offer of payment for reporting irregularities, we find that we have a sufficiently large number of irregularities reported to keep one man busy investigating and adjusting them. It might be of interest to know that in a population of approximately one million people, with some 45,000 customers, the average of recovered revenue is approximately $10,000 a year.

THE CHAIRMAN: Is there further discussion on this paper, gentlemen?

W. M. HALSEY, Newark, N. J.: In the section referring to applications, the Committee's recommendation that a customer moving to a new address should have no trouble in receiving service at that new location, should be followed out closely. At the period when people are getting ready to move from one apartment to another it is unreasonable to expect present customers to make a personal call at the company's office and sign an application for service at their new address, going through the formality of giving an additional signature. To send a telephone call or a written notice would suffice to make the necessary transfer for the company's records. It is probable that most companies have thousands of applications on file where customers have moved several times from one location to another. These additional signatures on file were probably of little or no value and do not add to our efficiency with the customer, and if there is a lack of service we are often criticised for that feature of our business.

Under the heading of Meter Reading, the Committee recommends that the Commercial Department report the fact of any intentional irregularity in wiring to the Legal Department. In my opinion the Commercial Department should investigate conditions on customers' premises, but should have someone from the Operating Department present in case a loss of current has been discovered, getting an effective settlement with the customer, as, usually, a customer is willing to pay a reasonable amount for service that has been unmetered. Usually, the Commercial Department is in a better position to prosecute the case of intentional non-indexing of current than the Legal Department.

Under the subject of Collections, I do not agree with Mr. Peck in reference to charging one dollar for the reconnection of the service where it had been discontinued for non-payment. It seems to me that a deposit on record is sufficient to protect the company from loss of bills rendered, and that it would be very objectionable to collect from every customer for the reconnection of the service where it had been discontinued for non-payment. There might be cases of course where the party is habitually delinquent, making it necessary to shut off for non-payment; in these special cases the cash covering the account still open would be fair recompense.

THE CHAIRMAN: Gentlemen, we will now go on with the schedule, if there is no further discussion.

R. S. HALE, Boston: One of the companies in which I am interested is planning to try an experiment in regard to deposits that may be of interest to you. We are planning to arrange that our stock, our securities, shall be available in small pieces —similar to the plan adopted by the Cities Service Company. We propose having bankers' shares worth about $12 apiece, and we are going to offer to receive these as security in lieu of a cash deposit. I do not believe we shall get many of these, because the people who will have them or buy them will have pretty good credit anyway, but I think it is going to be a pretty good way of popularizing the sale of our stock to our customers.

Another scheme which we are trying in Boston may be of interest, and that is in the case of apartment houses, the large apartment houses, where the people are moving in and out all the time. We have found a number of owners of such houses who have been willing to make an arrangement so that when a tenant moves out, we are automatically authorized to transfer the service into the name of the owner of the apartment house.

This leaves the service on, and the owner can show the vacant suite to a prospective tenant day or night. Also, when the new tenant moves in, he has the service and does not have to wait. The owner of the apartment house assumes the responsibility for any current that is used during the vacancy. The result is, I think, going to be a very large saving in our accounts and our transfers, and a very great convenience to our customers, and to the owners of the apartment houses.

One suggestion of the Committee which I like very much is that a man who applies for an adjustment for the first time should be given very unusual courtesy and his complaint should be settled to his satisfaction, if it is in any way possible. We have had that policy in Boston for a long time, and we think we base it on the old English common law, which provided that every dog should be allowed one bite, that a dog was not to be shot for the first time that he bit anybody, but the second time he bit anybody he was to be tried. Now, we adopt the same principle with our customers; each customer is allowed at least one complaint, and we settle it to his satisfaction even if we think he is wrong and we are right. We classify all our complaints as to whether it is the first complaint from the customer or whether he is a regular complainer. If he is a regular complainer, of course, we have to stand up for our rights, but if it is his first complaint we satisfy him if it is in any way possible to do so.

S. W. Borden, Summit, N. J.: I would like to ask the Committee if it has given any thought to the matter of a standard application. If it is possible to have a standard application, even for the ordinary resident customer, I think it would help a good deal.

I would like to know, too, if the majority of the companies put pole rights and right of way clauses in their applications. In all our applications, we put permit to maintain poles in front of the property, and that is one reason why we take an application from every customer.

Is it the custom to pay interest on deposits which are retained for less than a year?

In regard to changing meters at the request of the customer, we feel that in case of complaints it is very poor policy to take out the meter in question until the consumer has been satisfied that it is right. We find that can usually be done by installing an additional meter to get the same registration on the two meters; then the customer is satisfied. Otherwise, he is usually satisfied with the new meter, but he is forever convinced that the old meter was robbing him.

J. M. HOGAN, Buffalo, N. Y.: We have found it a very good plan to return all residential deposits after the customer has been prompt in the payment of his bills for a year. We have been doing this for the last couple of years and have received many favorable comments. We do not return commercial deposits, and I do not believe we will, as the chances of loss are considerably greater in this class of business. A number of the consumers who have received letters advising them that they may take up their deposits have shown the letters to their friends, and in this way we are getting some very favorable advertising.

J. B. SEAMAN, Philadelphia: I want to disagree with what is said in the first paragraph under "Meter Reading" In order that I may make myself clear, I would just like to say that I recognize the value of the personal element of our business. Carnegie, in answer to a question as to what he had learned from his twenty-five years' experience in the steel industry, said that he had learned that his organization was worth more than his physical assets; and I believe that anything that can be done in the way of bettering our employees is a good thing. The office boy of today is a manager tomorrow, and we have to build from the bottom up; but when it comes to meter reading, it seems to me that we could decrease the quality of this class of labor by using cyclometer meter dials. I remember some years ago we recommended to the Meter Committee that the 1's and 10's and the advertisement should be let off the meter dials. It took us several years to accomplish that result, but I believe you will acknowledge now that it is ridiculous to include on a meter dial anything except the circles and the words "kilowatt hours," and where necessary the constant. It seems to me that the next step, or a step in the right direction, is the utilization of a cyclometer dial on all meters I may be talking a little ahead of the development of the art in some companies, but I know there is a practical cyclometer dial on the market, and, while it costs a little more than a standard "circle dial," the investment would be more than compensated for in what would be saved in the labor necessary in meter reading; and then again, a consumer would check the meter reader provided the meter reading were left with each customer, and this should be done. Customers do not read their meters generally because they feel they are too much like a Chinese puzzle, and that it is impossible for them to read meters. With a cyclometer dial on the meter, they would check the meter reading each time a slip was left at the house, and in case of error would notify the company. Meter readers could read a great many more meters with a cyclometer dial than is now possible, thus effecting a further economy.

The Chairman: Any further discussion, gentlemen?

A. S. Witmer, Louisville, Ky.: I would like to inquire what the recommendation of the Committee would be on adjustment of claims for destruction of goods on account of interrupted service. I have in mind particularly coffee heaters, which usually cause quite a loss on a very short interruption.

The Chairman: If there is no further discussion, Mr. Bonsall will close.

Mr. Bonsall: Answering Mr. Peck with reference to leaving a meter on vacant premises, the Committee's recommendation that such practice be applied only to residences, apartment houses and small stores might be of special interest to him, in view of his statement that some people in his territory move five or six times a year. In Baltimore, we have been following this practice for four or five years, and the amount of current lost, that is, that cannot be charged against the outgoing or incoming customer, is negligible.

On the question of refunding interest on deposits on demand of customer, the Committee felt that if the practice of refunding deposits yearly were followed, this would include the interest and thereby minimize such demand. If, however, customer did not establish credit within a year, and it was advisable to retain his deposit, then the interest should be refunded yearly on demand. I might say that in Baltimore we have something like 190,000 gas and electric customers, with deposits in the first part of 1918 of about $29,000. We refund deposits after the first year, whether for residence or business.

As to what is done where party has been cut out for non-payment and another member of the family signs for service—we feel that our recommendation on the handling of discontinued collections covers this point; that is, that you can collect these accounts only by persistence. In the majority of states you cannot refuse to give service to one member of a family even though another member of the same family owes you a bill and still resides there.

With reference to unauthorized connections being referred to the Legal Department, it is debatable whether the best results can be obtained by the Commercial or by the Legal Department. It is very seldom that a company is able to secure a conviction, even though it is desirable to do so, therefore the department handling these matters must act in accordance with the policy of the respective companies. In regard to the informer's fee, this should not be restricted to meter readers, but should be applicable to any employee of the company. Personally, I do not think it should apply outside of the company's organization.

Concerning the use of a standard application, the Committee is discussing this now. One company has a small form, I think about 4 by 6 inches, which is issued in duplicate, the duplicate becoming the shop order on which the customer's account is either opened or closed. This makes for quick service and does away with the issue of a number of copies which is the practice in a number of companies.

Mr. Peck: Mr. Chairman, may I add one thing that I believe would be of interest? In New York State nearly all of the companies use a standard application form which was prepared by the Empire State Association, and we find it very useful and very convenient to our customers.

The Chairman: Possibly the gentleman who asked that question might secure from Mr. Peck a copy of the form.

The next report we will discuss is the Report of the Committee on Wiring, Mr. R. S. Hale, of the Edison Electric Illuminating Company of Boston, chairman.

REPORT OF WIRING COMMITTEE

The work of the Wiring Committee, as in past years, has been devoted to numerous more or less independent subjects, each of which forms a section of the report as here presented.

The first item is

Standardization of Plugs and Receptacles (Socket End of the Cord)

This matter is now involved in litigation, for which reason the Committee feels that a detailed report thereon should be postponed. If the situation should change between now and the date of the Convention, it may be possible to make a verbal report at the Convention.

Standardization of Appliance Plugs and Housings (Appliance End of the Cord)

It appears that the committees of manufacturers, referred to in our 1917 report, have, because of the war and other reasons, made but little progress. The matter is now to be taken up by a committee of the Associated Manufacturers of Electrical Supplies.

The chief progress that has been made is due to the consolidation of three of the large manufacturers who, as a result of the consolidation, have adopted standard prongs and standard housings on their appliances, these being arranged to take interchangeable plugs designed for use on the appliances of these manufacturers.

These particular prongs and housings will also take at least two other plugs which have been designed for use either on flat prongs or on round prongs, which may differ slightly in dimensions and distance apart.

While the design of these other plugs appears theoretically as though it might have poor contacts with resulting heating, yet if it should give commercial satisfaction, it will be a great help toward the practical standardization which will avoid the need of carrying several different designs of plugs, even if both flat and round prongs should continue in use.

Although progress is being made, yet there are several reasons why the standardization of appliance plugs and of the prongs and housings should not be pushed too fast.

Manuscript of this report was received March tenth.

It may, for instance, work out that different distances and dimensions should be used for articles that have heavy duty, such as good-sized flat-irons, while another design and set of dimensions may be so much better for articles of light use, such as fans, table lamps, etc., as to warrant having plugs that will not interchange. The use of 30-volt appliances may, or rather has, introduced other problems.

There are all sorts of questions arising, and the Committee feels that the most progress can be made by keeping the question actively before the manufacturers as well as by continuing the discussion among ourselves. The Wiring Committee has kept and will keep in close touch with the Merchandising Committee and with the manufacturers and their committees, and hopes that ultimately a wise standard may be arrived at which shall be of the greatest practical advantage to our customers who use so many appliances requiring plugs and cords.

Polarity on Plugs and Receptacles

The Committee continues to have this point in mind and to recommend that all plugs and receptacles hereafter made should be designed for polarity use. This can be done easily on practically all the designs now on the market, and done without any extra expense in manufacture, as it requires only a little thought in design and choice of some of the minor dimensions. At present, however, there is no call or need for distinguishing polarity on anything except possibly a very negligible percentage of appliances.

There are millions of flat-irons, percolators, toasters, table lamps, etc., in common and current use whose plugs do not provide in any way for the distinction of polarity.

Since so many of these are in use to the satisfaction of everybody, no action regarding polarity should be taken that would interfere unnecessarily with the use of the existing devices.

Standardization of the Portable Cord

There are two kinds of standardization, viz., as to dimensions and as to quality.

Standardization of dimensions is the kind of standardization referred to when discussing the dimensions of screw threads.

The Committee feels there is no need or advantage in standardizing the portable cord (in between its plugs) so as to forbid any design or dimensions that are safe.

Standardization of quality is a different thing. The Committee feels that the cords to be used by our customers should exceed a minimum standard of quality as respects tensile and dielectric strength under actual conditions of use, and that the use of cords not reaching this standard should be discouraged and forbidden if possible.

The Committee feels, however, that the determination of the standard will not be arrived at by discussion around a committee table, but that it should be worked out by field experience under the observation of inspectors and central station men.

The quality of the connection between the cord and its plugs at either end is of course of equal importance with the quality of the cord itself.

Standardization of Range Connections to the Wiring

The Committee sees no reason for reversing the position it took in its 1917 report to the effect that this is properly a commercial and manufacturing question, and that any rule regarding standardization would be harmful rather than beneficial.

The manufacturers of ranges are continually trying to improve their product, and any rule that would interfere with improved designs coming on the market would hurt the industry. Improvement will go on much faster without a rule than with one.

Fires from Flat-Irons, Immersion Heater Elements, and Similar Devices

In its meetings the Committee has discussed with great interest the fact that the Underwriters are having reported to them a seriously large number of fires that arise from the carelessness and misuse of these and similar devices. Though the losses are not big individually, the number is so large as to make the matter of importance.

The matter is of interest to the Wiring Committee in that from time to time it has been suggested that there should be rules requiring special wiring devices in order to reduce the liability to fires of this nature.

In the opinion of the members of the Committee, 75 per cent of the flat-irons, etc., are used from sockets, so that any rule that would require any special device on the wiring would be apt not to increase safety, but to decrease it, because people would use their flat-irons, etc., off the lamp sockets instead of going to the expense of any safety device on the wiring.

The Committee feels at the present time that the most effective way to reduce these losses is to educate the public against carelessness.

The Publications Committee of the Commercial Section, N.E.L.A., has prepared leaflets on this subject, which can be used by member companies for distribution to their customers or in other ways.

Concentric Wiring and Other Methods of Wiring

The facts presented in the 1917 report of our Committee have not been controverted, and the Committee still feels that rules which do not allow the use of concentric wire, even under the conditions under which it has been proved safe and satisfactory, are a burden to our industry.

In regard to the other methods of wiring that are in safe and practical use in other countries, the situation is just the same as in regard to concentric wiring. These other systems are discouraged and in effect are forbidden by interests that practically control development in this country; and while the people who control our development claim that if there should be any demand for those methods of wiring they will change the rules, yet the situation is that new methods are not put into the code until they have been tried out in the field in this country so as to create a real demand. At the same time the present rules prevent any general trial under any conditions to such a large extent that almost no progress is made, as compared with the development and improvements abroad.

As an example, during the past year an engineer who previous to the war had built factories in Belgium, France and other countries for the manufacture of several of these systems of wiring, attempted to interest capital in this country. He reports that financial people and manufacturers hesitate to do anything until they can feel sure that the new methods will be considered on their merits, and the result is that up to the present almost nothing has been done.

We feel it important that this country should be free to adopt the best methods, and that, even if the present methods have been satisfactory in the past, new and better methods should be encouraged, and not discouraged.

The Committee hopes that the various code committees, especially the committee which draws up the National Electrical Code, will adopt methods of investigation, and of trying out new methods of wiring (including the foreign methods of wiring that are already in use abroad) with a view to the early introduction into this country of every method that is safe and good.

Solid Neutral

In its 1917 report the Committee took the position of favoring the solid neutral from the generator or transformer to the lamp in a grounded system, this including the grounded side of two-wire branches from three-wire systems.

The Committee continues to report that it feels this is only the logical conclusion to the changes that have been made since neutral fuses were required in all cases.

Originally fuses were required on all neutral wires. Such fuses are, in the opinion of the Committee, an unnecessary expense whenever the neutral is grounded, and in many cases are a positive danger. The rules now allow their omission in nearly all cases, except the fuse on the grounded or neutral side of the two-wire branch. In the opinion of the Committee there is no reason why the fuses on the grounded wire should not be omitted in all cases, with a resulting saving to the public.

Color of Neutral Wire

In its 1917 report the Committee recommended that steps should be taken to have the outer or potential wire of a different color, or distinguishable in some way from the neutral or grounded wire.

Some cities had already adopted rules to this effect, and since our 1917 report the National Fire Protection Association Committee has reported in favor of this procedure; but on account of the war the enforcement of this rule has been temporarily dropped. The Committee hopes that further progress will soon be made in this direction.

Size of Wire

In its 1917 report the Committee reported that the use of No. 16 or larger wire should be encouraged for all portables, but took no action on any use of smaller wires.

At present the rules of most codes require that permanent wiring shall be of No. 14 or larger.

This rule, in the opinion of the Committee, is not needed on account of the life or fire hazard, and probably exists merely for the reason that in a large number of cases it is good judgment to use No. 14 wire or larger, even on circuits where the load is much under the limit that the wire can carry.

The Committee realizes that the use of the large wire is occasionally advantageous, as in the case of circuits on which the load may later be increased.

The Committee also realizes that it may be cheaper for a wireman to run all his wires of No. 14 in order to carry in stock a fewer number of sizes of wire.

It is clear, therefore, that there should be no rule to prevent our customers having all their wires No. 14 or larger.

On the other hand, the Committee feels that if there are any cases where No. 16 or No. 18 or even No. 20 wire will amply carry the load that will be connected to the wire, and if in such cases a saving in expense can be made, then our customers should be allowed the benefit of this saving.

The error of the present rule may be clearly shown by the following illustration: Supposing one of our customers puts in a table lamp connected by a portable cord to the circuit. The wire in this cord by the present rule could be No. 18 wire. It is subject to kicking around on the floor and to other abuse, and is also liable to be overloaded because the customer may easily connect a current-consuming device to the socket in the portable lamp.

Now supposing the customer, keeping the same cord, runs it up the wall, loops it over a bracket, and at the end of the cord puts a single lamp for illuminating a portrait.

It is evident that there is far less danger of its being overloaded electrically or injured mechanically.

If the wire were merely hung loosely over the bracket, an inspector who was looking to see whether the rules were enforced would probably not say anything. If, however, the wire were permanently attached to the bracket, he would very likely raise a question, but in the end would probably pass it.

Next, suppose the customer takes the same No. 18 wire with the same insulation, but instead of letting this wire lie on the floor or hang over a bracket where it is exposed to mechanical injury, suppose that the customer runs a solid conduit inside the wall from the place where the wire starts, and continues this conduit up to the ceiling where the lamp is to be placed, and puts the No. 18 wire inside this conduit.

Now there is no question that the wire is much safer than formerly, and yet the inspector looking after the enforcement of the rule, would at once prohibit the safe construction, and this would force the customer to go to the unnecessary expense of changing the wire. In practice the customer would not put in the conduit, but would leave the wire loose in the room; in other words, would use the less safe construction in order to satisfy the inspector.

In this particular case it is clear that the code rules encourage unsafe construction and forbid safe construction.

While it may be said that it is difficult to get any code that is perfect in all details, yet in this case the trouble is caused not by the details, but by failure to observe the principle that rules for fire or safety protection should confine themselves only to fire and safety, and should not attempt to enforce something which does not affect the fire or safety hazard. Neglect of this principle, even in order to promote good engineering, has an injurious result, as in this instance when it encourages unsafe construction. The use of No. 14 wire or larger on circuits where smaller wire will safely carry the load should at most be a recommendation, and not a rule.

The present rules, which require No. 14 or larger wire for all circuits, even though they carry very small amounts of current, are not rules for safety and fire protection, but are rules or notice to contractors that the engineers who desire to guide our industry believe it is more economical to have a single size of wire rather than to use in any case the smaller sizes. Hence the rule should be revised.

Connection Between Inside Wiring and Outside Lines

A section of our 1917 report presented in outline how such rules should be arranged, with illustrations drawn from the existing rules of different companies, some of these being given exactly as they stand, and some with certain modifications suggested by a sub-committee.

It was planned to carry this further and to simplify it still more by presenting a smaller number of illustrations, so that the report of the Committee would be more in the form of a code which could be adopted by any company with such changes as were needed to fit its local conditions.

The advantage of having similar rules in different cities for the connections between inside wiring and outside lines is obvious.

Of course any portion of the work as is already covered should not be interfered with. For instance, the National Electrical Code, has certain provisions affecting these connections, and the proposed code should not adopt new provisions, but should merely recommend so far as practicable that the National Electrical Code be used for such parts of the subject.

The location of the meter is another item, and the proposed code should not adopt new sections on this, but should probably merely suggest that the section of the Meter Code on location of meters should be used for that part.

The 1917 compilation will, in the opinion of the Committee, be a good foundation for any company planning to revise its rules for the connection between inside wiring and outside lines.

The question as to whether the 1917 compilation should be further revised is under consideration by the Committee by correspondence, and if this year's Committee feels that the compilation of 1917 should be further revised and simplified, it will be a subject for next year's Committee to take up.

National Electrical Code

The Wiring Committee, as representing chiefly the Commercial Section, has naturally taken a great interest in the various codes that affect the progress of our industry. Of these the

(United States) National Electrical Code, prepared by a committee of the National Fire Protection Association, is the most important. The Safety Code, prepared by the Bureau of Standards, and the Illuminating Code also affect the users of our service. These three codes have no legal standing of themselves, but they are usually the basis of the codes that are actually adopted by the various local authorities.

The problems arising about the codes are, on the one hand, the technical problems which should be determined by statistical records, or field experience, or when such records are not available, by laboratory tests, and, on the other hand, the commercial problems as to the effect of the codes on the growth of our industry. The commercial problems are peculiarly for the commercial man.

Another division of the code problems is a division of any code into the constructive sections which specify certain materials and methods as good and safe, and on the other hand into what might be called the destructive portions which forbid other materials and methods. The constructive portions of the codes in use in this country are on the whole excellent, and installations conforming to these codes are usually considered good.

In our opinion, however, there are many other safe forms and methods which are, in effect, not permitted by the codes. This is commercially a very unfortunate situation and is something which is seriously hindering the growth of our industry as compared with what the growth would be if the use of electricity were allowed to develop freely by means of all safe methods.

It is true that so long as even one safe form or method is allowed by the constructive portions of the codes, our industry will continue to go ahead.

Electricity is so advantageous that new houses and buildings will be wired almost irrespective of expense; and in the United States so many new houses are built each year that electricity is in more general use than in old countries which are doing less building. Compared, however, on the basis of the old houses which were not wired when they were built, our country stands by no means as well, and the reason is that our codes practically discourage and even forbid many safe methods.

If all good codes were made permissible, some of the difficulties would disappear; but we recognize the troubles which arise from having several codes on the same subject, especially when work is done under different jurisdictions, as when goods are manufactured in one place but used in another.

If, however, the principle should be adopted that the one code should never forbid any safe and good method, the difficulties would largely disappear.

It is true that this is presumably the ideal of any code, but in the past it has taken too long to get new and safe methods printed in the codes.

That there are many items practically safe and yet forbidden by the codes is apparent when we consider that probably a majority of new installations contravene the codes in some major or minor respect, and a much greater proportion of old installations contravene the code in many ways, and yet almost none of these infractions of the code causes fire or accident, since the infractions are in regard to items on which the codes are unnecessarily severe. Very few dangerously bad installations are in use; but if the codes should be literally and fully enforced in all cases, our present customers would be put to a great expense, an expense hard to calculate. The one item of removing the grounds inside the building (not the ground to the water pipe at the service, but the other miscellaneous and incidental grounds), would cost millions of dollars. That the codes are not fully and literally enforced, is the safety valve which enables our customers to continue to use their existing wiring.

Of course it is important that such defects as are really dangerous should be removed, and we look forward to the time when there shall be a national or even international code that shall include all safe methods, or that at least shall practically allow all safe methods.

Such a code can then be made obligatory and really enforced. That time will be reached the more quickly, the greater the number of safe methods that are included in the code. That time will be reached more quickly, the sooner the destructive sections in our code which forbid certain methods under all circumstances, merely because they are unsafe under some particular circumstances, are eliminated or revised.

Today, for instance, heavy solid conduit, heavy flexible conduit, armored cable, metal moulding of more than one design, wood moulding, concealed knob and tube, open wiring, and various forms of loose wiring (this last item refers to portable cords) are allowed, each under conditions which presumably make it safe.

Is there any reason why the numerous other methods which have been in satisfactory use for long periods under certain conditions should not be allowed everywhere under the conditions under which they have been proved safe?

If a manufacturer starts to place a new method of wiring on the market, should he not only be allowed, but encouraged, to have it tried out under conditions of actual use, and should he not feel sure that the final judgment shall be made solely in accordance with the interests of the customers or users of our electric service?

It is not enough for the code authorities to say: "Prove that your new method is safe and we will put it in the code." It takes a long time to prove anything to a majority (in practice to much more than a majority) of any set of men.

If the mere introduction and trial of a new method involves the convincing of a large body of men, then no matter how high their character and ability, such a requirement surely checks improvements.

Some arrangement should be made so that new methods can easily be tried out in the field, and assurance should be given that unless the new methods turn out unsafe, that is, until trouble begins to develop, they will be allowed to grow and prove their value.

It is a fundamental principle of American freedom that "every man is to be considered innocent until he is proven guilty."

The same principle should apply to the new methods; and while any new method may properly be watched, inspected and guarded, yet the rules should be drawn so as really to allow it to develop. The rules should punish it only after it is proved guilty, and all of us should work constructively to develop as many new, safe and good methods as possible.

This has always been the object of your Committee, and we recommend that the N.E.L.A. continue this policy.

Tests of Wiring

It is obviously important that our methods, specifications, and rules should be based primarily on field experiences, or, when they are unavailable or uncertain, should be based on tests that shall be as nearly as possible under field conditions.

With this object in view, the Committee arranged in 1917 for the starting of tests of various methods of wiring, and started plans for recording reports of field experience, as well as reports of tests.

The general idea is to obtain for each method of wiring reports of its condition at various ages and under various conditions.

When these records are complete, they will show for each kind of wiring its condition at various ages, i.e., at the end of one year, five years, ten years, etc., under various conditions as in a dry atmosphere, under wet conditions, exposed to heat, etc.

At first there will be many cases for which data will be lacking; but the layout for the records is such that the missing data will gradually be filled in, so that at the end of a period of years the records will be complete enough to be of great practical use.

It will be only natural if at first some of the records and tests appear to be contradictory; but the best way to reconcile such contradictions as may appear will be to make the data generally available.

The Committee therefore presents this year three appendices to the report.

Appendices I and II deal with the relative value of slow-burning vs. rubber-covered wire.

With the advent of large types of units for electric lamps, there was a tendency for the Underwriters' inspectors to object to the use of these units in lighting fixtures because of the increased deteriorating effect on the rubber insulation in the fixture wire, due to the high temperatures in the fixture resulting from the use of these large type C lamps. It was obvious that if this effect was a real danger, the users of large fixture units would be confronted with a very embarrassing situation, because it would necessitate rewiring present fixtures with something that was less affected by the heat, for which wire insulated with "slow-burning" insulation was suggested.

Two investigations have been made to obtain some information as to just how serious, as a practical matter, the deterioration of rubber insulations at high temperatures becomes in actual service. One investigation was made by the Engineering Department of the National Lamp Works of the General Electric Company at Cleveland, and another was made by the Electrical Testing Laboratories for the Commonwealth Edison Company of Chicago. Rather complete summaries of these two important investigations are included in Appendices I and II respectively These investigations not only involved all the conditions existing in actual installations, but they were much more severe than would be encountered in any ordinary installation.

In brief, these investigations indicate that although the severity of the tests is undoubtedly greater than would be encountered in practice, the rubber insulation would be *at least as satisfactory* as the "slow-burning" insulation, and although the mechanical properties of the rubber insulation are impaired after the wire has undergone continuous heating at such temperatures, the depreciation of the mechanical strength would not cause trouble in fixtures where the wires are not subjected to a bending action. Even after 3,000 hours at 180 deg. fahr., and with the specimens subjected to continuous vibration, the rubber insulation still had a very considerable amount of elasticity, an amount which would insure without question that there would be no actual breaking of the insulation due to any ordinary mechanical treatment.

While the tests indicate the above conclusions, it should be understood that the Committee does not necessarily endorse these or any conclusions, but believes the most progress will be made by the presentation of all the data available in order that our methods may be based on real experience.

Appendix III deals with the tests and records now under way at the Electrical Testing Laboratories. These tests have not been in progress long enough to warrant the drawing of any definite conclusions, but it will be noticed in the appendix that provision is made not only for the reporting of the results of the Laboratory tests, but also for the reporting of the results of field experience for different kinds of wire at definite ages under different conditions.

As said before, these reports and data may at times be contradictory, but it is the intention of the Committee to present them as fast as practicable so that our future methods shall be based on real experience.

Later the Committee may attempt to draw definite conclusions from these and other data, but we wish it clearly understood that at present we are only presenting the data so far available, in the hope that ultimately sufficient data may be made available so that there shall be no dispute as to the conclusions to be drawn.

Respectfully submitted,

R S Hale, *Chairman*
S E Doane, *Vice-Chairman*
H W Bliven
Rawson Collier
Theodore Dwight
A P Good
E A Hawkins
D A Hegarty
J A Hunnewell
T A McDowell
E R Northmore
Farley Osgood
A A Pope
H R Sargent
R H Tillman
H H Wood

APPENDIX I

Tests of Slow Burning *vs.* Rubber Insulation

Made by the National Lamp Works of the General Electric Company, Cleveland, Ohio

The following is a summary of a report of tests which were made by the Research Section of the Engineering Department of the National Lamp Works of the General Electric Company to obtain some information as to the relative durability of rubber insulation and "slow burning" insulation.

Introduction and Object

The use of insulation on wires is mainly for two purposes. The first is to keep the wires separated mechanically from each other and from conducting structures, and the second is to keep the wires electrically insulated from each other.

Both the mechanical and electrical qualities should be considered when ascertaining the durability of insulation, particularly when temperature is involved. Tests carried on by other investigators have shown that temperatures which have ruined the insulation mechanically have not impaired the electrical qualities to any large extent. It was the purpose of this test to learn something of the change of the electrical and mechanical properties of rubber and "slow burning" insulation on wires when subjected to different temperatures for various periods of time.

Description of Tests Made

The first test was made to determine the change in mechanical strength of rubber insulation at different temperatures for various periods of time. The tests were made on a standard brand of No. 14 B. & S. lamp cord, National Electrical Code Standard.

The second test was made to determine the change in electrical insulating properties of both rubber insulation and "slow burning" insulation with temperature and with time. The rubber insulated wire used in this test was a standard make National Code wire, No. 14 B. & S. solid. The "slow burning" insulated wire was of standard make, No. 14 B. & S. solid.

Methods

Specimens of the various samples of wire were cut 6 inches in length. These specimens were placed in four separate compartments in an enclosed box, each of these compartments being maintained at a different temperature throughout the test. The four compartments were at the top of the box and the heat was supplied by incandescent lamps at the bottom of the box under the compartments. The temperatures were kept constant by varying the opening in the bottom of the box or changing the wattage input to the lamps. Temperature was measured with a mercury thermometer every working day.

In the first test twelve specimens of rubber insulated wire were placed in each compartment, and in the second test six specimens each of rubber insulated wire and "slow burning" insulated wire were put in each compartment. Specimens were removed from all compartments for tests each week.

The rubber insulation was tested for elasticity by first removing the braid from the specimens and then cutting off a tangential strip of the insulation in the usual manner. Ink marks were then placed 2 inches apart and at the center of these 6-inch rubber test specimens and the rubber then stretched until the marks were 2½ inches apart, the rate of stretch being 0.35 inch in three seconds. The rubber was then immediately released and the distance between the marks measured after a lapse of ten seconds. The test specimen was then stretched until rupture occurred. All tests were made at room temperature.

The insulation resistance was measured by the standard series galvanometer method using 600 volts for the rubber insulated specimens and 44 volts for the "slow burning" insulated specimens. The resistance was measured between the copper wire and a mercury bath in which the specimens were immersed.

The high voltage tests were made in the usual manner with a step-up transformer the potential of which was raised at approximately 1000 volts per second, the mercury electrode arrangement employed for the resistance measurements being used. The rubber insulated samples were first subjected to 10,000 volts for one minute before raising the voltage to puncture.

Summary of High Voltage Tests

VOLTS AT PUNCTURE

Hours Subjected to Heat	Rubber Insulation 121° F. Specimens	142° F. Specimens	161° F. Specimens	200° F. Specimens
0	18625	18625	18625	18625
152	20000	20000	15750	20000
305	18250	20000	20000	19500
457	18250	19500	20000	17000
624	16500	10000	20000	17500
792	15250	19000	19000	18000
960	19000	17500	19750	19500

Hours Subjected to Heat	"Slow Burning" Insulation 121° F. Specimens	142° F. Specimens	161° F. Specimens	200° F. Specimens
0	2900	2900	2900	2900
152	2750	2750	2250	3000
305	2500	2500	2750	2750
457	2750	2750	2750	3000
624	2500	2500	3000	3250
792	2500	2750	2000	3250
960	2750	2500	2250	3750

Room temperature, 74°F. Humidity, 55°.

Note:—The 200° specimens were tested with brass strip electrode 1 inch wide, other specimens with 1-inch mercury electrode 1¼ inches long.

Summary of Insulation Resistance Tests.

INSULATION IN MEGOHMS PER LENGTH OF 2⅞ INCHES

Hours Subjected to Heat	Rubber Insulation 121° F. Specimens	142° F. Specimens	161° F. Specimens
0	—*	—*	—*
152	350,000	—*	—*
305	350,000	—*	350,000
457	—*	140,000	140,000
624	—*	350,000	350,000
792	—*	—*	140,000
960	—*	140,000	—*

* Resistance too high to be measured with instruments used.

Hours Subjected to Heat	"Slow Burning" Insulation 121° F. Specimens	142° F. Specimens	161° F. Specimens
0	200*	200*	200*
152	140	231	219
305	159	162	278
457	489	203	377
624	181	234	264
792	178	480	347
960	164	220	341

*Average of four specimens—301, 105, 130 and 264 megohms respectively.
Room temperature, 70°F. Humidity, 57°.

Summary of Mechanical Tests, Rubber Insulation

Elasticity Test

Hours Subjected to Heat	Inches between marks 102° F. Specimens	122° F. Specimens	156° F. Specimens	201° F. Specimens
0	2.016	2.016	2.016	2.016
168	2.023	2.016	2.031	—*
336	2.031	2.023	—*	—*
520	2.039	2.023	2.047	—*
688	2.023	2.016	2.016	—*
856	2.023	2.016	—*	—*
1008	2.016	2.016	—*	—*

* Specimens broke either at or before specimen was stretched 2⅛ inches between marks.

Ultimate Stretch Test

Hours Subjected to Heat	Inches between marks 102° F. Specimens	122° F. Specimens	156° F. Specimens	201° F. Specimens
0	3.02	3.02	3.02	3.02
168	2.94	2.88	2.63	2.50
336	2.88	2.84	2.44	2.38
520	2.69	2.84	2.69	2.19
688	2.78	2.75	2.53	2.13
856	2.81	2.78	2.38	2.06
1008	2.81	2.78	2.38	2.00
Stretch, final in % of initial	79.2	76.5	37.5	0

Each figure is the average of two tests.

Bending Test

Fig. 1 and Fig. 2 show the results of bending tests on short pieces of various specimens of rubber insulation and "slow burning" insulation respectively after various periods of bending. Each specimen was bent until a crack developed.

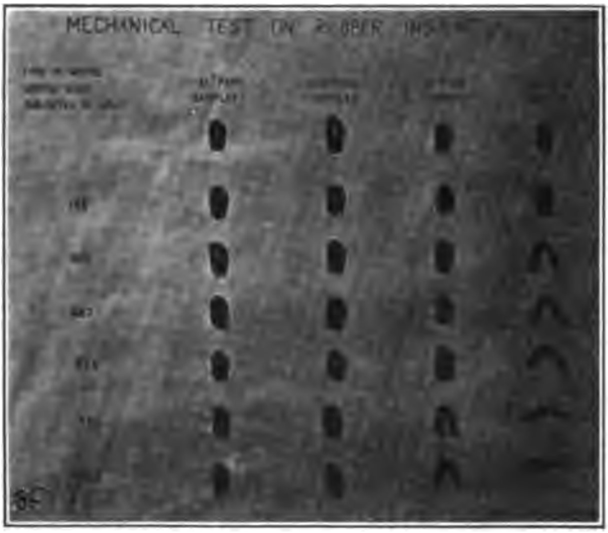

FIG. 1—ANGLE AT FIRST CRACK IN BENDING TEST, RUBBER INSULATION

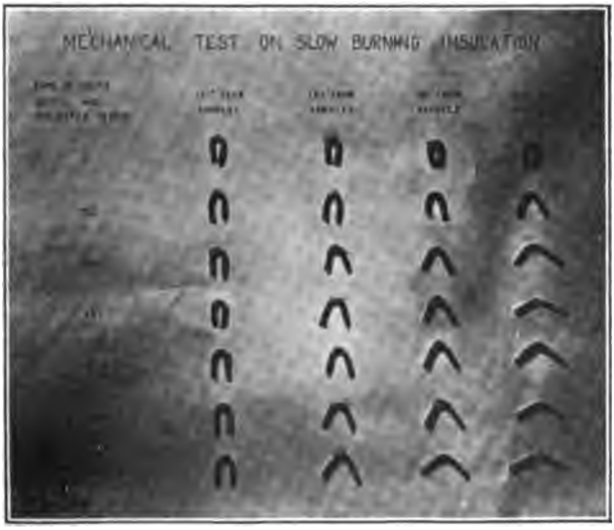

FIG. 2—ANGLE AT FIRST CRACK IN BENDING TEST, SLOW BURNING INSULATION

Conclusions

The results indicate that there is no apparent relation between time and insulation resistance or dielectric strength in the case of either material. They do show, however, that the rubber insulation had very much higher insulation resistance and dielectric strength throughout.

As to the mechanical properties, it was, of course, to be expected that the rubber insulation would show a very marked effect of heat. The bending test, however, indicates that the rubber insulation did not suffer any deteriorating effect for several weeks at 160 deg. fahr. or under, but during the fifth week at this high temperature the mechanical strength of the rubber began to be impaired.

The report concludes as follows:

"To arrive at more definite conclusions, it will be necessary to test many more samples of insulated wire and to use specimens of greater length. The results of this test indicate, however, that there is no great deterioration of the electrical qualities of the rubber insulation on wires when subjected to such conduit temperatures as are produced by incandescent lamps.

"Although the mechanical properties of rubber insulation are impaired after the wire has undergone continued heating at high temperatures, there seems to be no tendency of the rubber to flake or fall off, indicating that depreciation in the mechanical strength of the rubber should not cause trouble in fixtures where the wires are not subjected to bending after the deterioration has taken place."

Date of report, Sept. 22, 1915.

APPENDIX II

Tests of Slow Burning *vs.* Rubber Insulation

Made by the Electrical Testing Laboratories for the Commonwealth Edison Company of Chicago

The following is a summary of a report of the results of an extensive investigation made by the Electrical Testing Laboratories for the Commonwealth Edison Company, Chicago.

Object of Investigation

The object of this investigation was to show the relative durability of fixture wire insulated with standard rubber compound insulation and wire insulated with so-called "slow burning" insulation when installed in fixtures employing large lighting units, such as Type C incandescent lamps.

In general, the particular feature of the conditions existing in such installation is the temperature of the wire adjacent to the lamp which, because of the high temperature at the base of the lamp, may be abnormally high due to conduction of heat along the tubing of the fixture or along the conduit pipe. The fixtures, in addition, may be subject to more or less vibration which may be either continuous, due to operation of machinery in the building, or intermittent, due to passing elevated trains, steam trains, surface cars, heavy trucks, etc. Also, the wire in these fixtures may be subject occasionally to more or less twisting due to tightening of the lamp receptacle which may become loosened from time to time. The problem was therefore to determine, if possible, which of the two types of insulation is more durable when subjected to the combined effect of heating, vibration and twisting.

While it is obviously not feasible to duplicate exactly actual conditions because of the very great variation in such conditions, it was thought that a laboratory test involving the elements of temperature up to 180 deg. fahr., vibration and twisting, combined with time up to 3,000 hours, would at least aid in arriving at a conclusion. Such a test was therefore carried out as described in detail later in this report.

Outline of Test

The following schedule of tests was arranged after conferring with Mr. Durgin of the Commonwealth Edison Company:

(1) Subject specimens of both kinds of wire installed in pieces of solid conduit to a temperature of approximately 120 deg., 150 deg and 180 deg. fahr., respectively, for 750, 1500 and 3000 hours respectively.

(2) One set of specimens for each temperature and each test period to be subjected to continuous vibration. At the end of the test period, each specimen to be subjected to a high voltage test to breakdown.

(3) One set of specimens for each temperature and each test period to be kept stationary (that is, not vibrated). At the end of the test period, each specimen to be subjected to a high voltage test to breakdown.

(4) One set of specimens for each temperature and test period to be kept stationary, but at the end of the test period, each specimen is to be given three twists in a length of about 20 inches (that is, three complete turns) before being subjected to the high voltage test to breakdown.

(5) Make physical tests of samples of the rubber insulation from each set of specimens.

(6) Make such bending and twisting tests as would aid in showing the relative effect of the tests on the two kinds of insulation.

Description of Wire

The following is a description of each of the two kinds of wire submitted:

(a) Rubber Insulation. Wire with two thicknesses of insulation was used. Most of the specimens made were taken from wire with the thicker insulation, but as enough of that wire could not be obtained at once for all of the specimens, a few of the specimens were prepared from the wire with the thinner insulation.

The rubber compound was apparently the standard National Code compound in both cases. It was covered with a single layer of cotton braid impregnated with a black compound. The various dimensions were as follows:

	Large Wire	Small Wire
Size of copper conductor, A. W. G.	16	16
Nominal thickness of rubber insulation, inch	1/32	1/64
Thickness of braid, inch	0.018	0.018
Outside diameter, inch	0.165	0.120

(b) "Slow burning" Insulation. This wire was insulated with three layers of cotton braid impregnated with the usual fire-resisting paint which was apparently white lead, zinc oxide or some similar material. The wire was nominally No. 14 A. W. G., and the outside diameter was about 0.210 inch.

Preparation of Test Specimens

The test specimens were prepared by cutting off pieces of wire about 24 inches long and inserting two such pieces of wire side by side in a piece of ½-inch enameled steel conduit about 24 inches long. One end of the pair of wires was carefully wedged by means of a wooden plug at the end of the piece of conduit. The other end was similarly wedged by a wooden plug after the pair of wires had been given two complete twists. Thus each piece of conduit contained one pair of wires which was kept twisted together by means of the plug wedges at the ends.

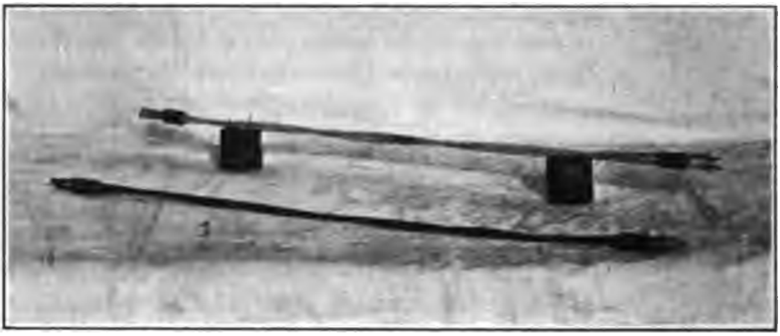

FIG. 1—TEST SPECIMEN OF WIRE

Fig. 1 is a photograph showing a pair of wires with the wood plugs, and Fig. 2 shows a complete specimen, that is a piece of conduit with the wire in place.

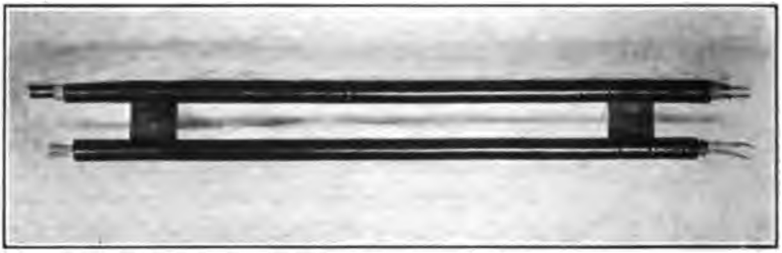

FIG. 2—TEST SPECIMEN, COMPLETE

Heating Chambers

The heating chambers consisted of tubes of light galvanized iron 4 inches in diameter and about 30 inches long. Fig. 3 shows one heating chamber, and Fig. 4 shows the complete set-up. These pipes were wrapped with asbestos paper and the desired temperature was obtained by circulating low voltage alternating current through the pipe. In each pipe or chamber were placed ten test specimens (that is, ten pieces of conduit each with a pair of wires wedged in place), five of each kind of wire (Fig. 5). The ten specimens were bound together and held in place in the pipe by a suitable wood spacing block near the ends of the pipe. There were used in all eighteen of these heating chambers connected in pairs, each pair holding ten specimens of each kind of wire. Thus there were six heating chambers for each of the three test conditions (vibrating, stationary and twisted), two in each group being held at each of the three temperatures. By using eighteen heating chambers, the

FIG. 3—HEATING CHAMBER

total time required to make the test was limited to 3000 hours because half the specimens in each pair of heating chambers were removed at the end of 750 hours, leaving the other half to continue. After another 750 hours, the vacant spaces were filled again with another set of specimens so that at the end of 3000 hours a set of specimens for a 1500-hour period was obtained as well as one for a 3000-hour period.

Vibrated Specimens

The arrangement used for the specimens subjected to vibration is shown in the foreground of Fig. 4. A group of six heating chambers was mounted in a substantial wood frame which was hinged at the lower rear corner. By means of a motor driven cam the opposite lower corner was raised and suddenly dropped 125 to 150 times per minute. The amount of this drop was approximately ¼ inch, that is one end of the frame was stationary while the other end dropped about ¼ inch. The distance between the stationary corner and the point of application of the cam was about two feet.

It is to be noted that this treatment is much more severe than would ever be found in service.

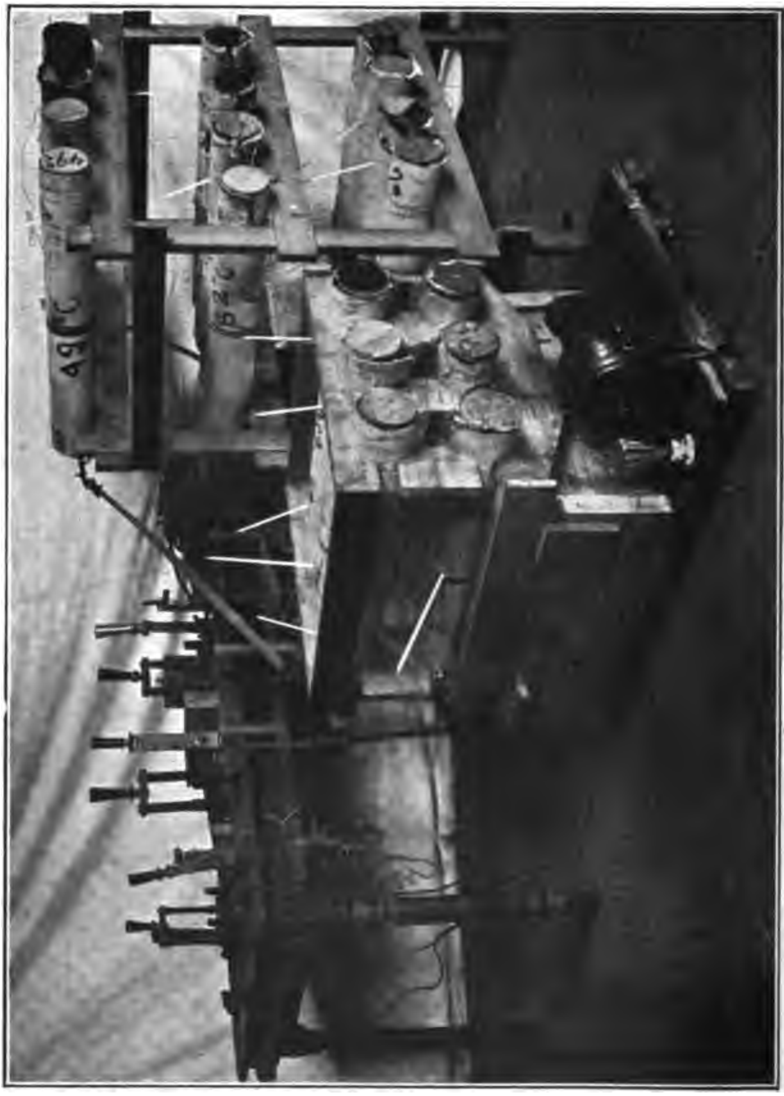

Fig. 4—Samples Under Test

Temperatures

The various temperatures were measured with mercury-in-glass thermometers placed in small holes in the heating chambers, the bulbs of the thermometers being adjacent to the conduit pipes. The six heating chambers which were to be held at the same temperature were all connected in series so that the same heating current flowed through all six. Any differences in the heating of the individual heating chambers of the group, due

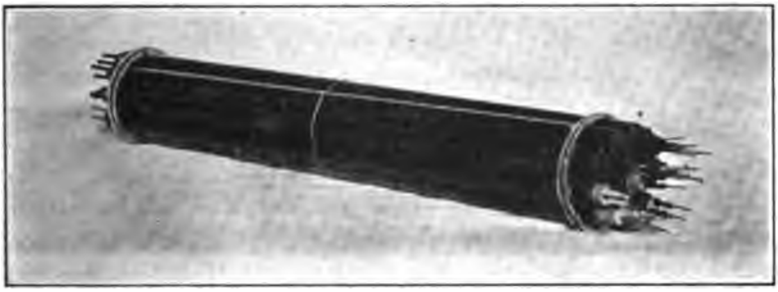

FIG. 5—SPECIMENS AS PLACED IN HEATING CHAMBER

to differences in the electrical resistance of the pipes, were adjusted by shunting, by means of small copper wires, some of the current around the individual pipes which were too hot.

The current in each series of heating chambers was adjusted until the proper temperature had been reached and then held constant until such changes as were necessary to compensate for changes in room temperature were made. The temperatures to be held were 120 deg., 150 deg., and 180 deg., respectively. It was not found possible, however, to hold all of the heating chambers at exactly the assigned value, consequently the temperature of a group of chambers varied from time to time. However, this variation and also that of the individual units of a group rarely exceeded +3 deg. cent. (5.5 deg. fahr.), although occasionally the temperature of an individual chamber would get as much as 5 deg. cent. (9 deg. fahr.) from the nominal value. This was usually due to a rapid change in room temperature between readings.

Readings

After each heating chamber had been adjusted to approximately the proper temperature, thermometers were kept continually in most of the heating chambers of each temperature group. Occasionally some thermometers were removed for a time for use elsewhere. Readings were taken every two hours throughout the test, the test being run continuously day and night, except for holidays and Sundays.

Summary of High Voltage Tests

The high voltage tests were made by applying the potential to the two wires constituting a pair, the wires being left in the conduit just as they were "baked" except, of course, in the case of those specimens given three extra twists after "baking." The potential was applied first at a low value and then gradually raised to 1500 volts, which potential was maintained for five minutes. The potential was then raised to 3000 volts, which potential was held for one minute. If the sample did not puncture, the potential was gradually raised until puncture or flashing around the ends of the wires occurred.

SUMMARY OF RESULTS

(Each value is average of tests of five specimens.)

		Average Volts at Failure					
		S. B. Insulation			Rubber Insulation		
Period, hours	Aging temperature, deg. F.	S	V	T	S	V	T
750	120	9300	8100	7500	17200	15400	15600
	150	9400	8400	7700	17000	14500	16600
	180	8900	7400	7400	15700	15300	17300
1500	120	7900	7500	7400	14200	14500	13900
	150	7000	7800	6800	16000	10100	14400
	180	8000	8000	7900	14000	13900	15700
3000	120	8800	8600	7300	16000	13300	13200
	150	8400	7700	7300	14200	14000	13800
	180	8400	8500	7400	13400	13700	13300

"S" = Specimens stationary and tested as aged.
"V" = Specimens vibrated and tested as aged.
"T" = Specimens stationary and twisted 3 turns after aging.

Summary of Mechanical Tests of Rubber Insulation

These tests were made in general accordance with the practice of the Underwriters' Laboratories. In each of three tests made on each specimen, one piece of the specimen was used for the tensile strength test and a separate piece for the set and elongation test. In the latter test, bench marks 2 inches apart were first placed on the specimen. It was then stretched until these marks were 4 inches apart, held for two minutes, released and the distance between the marks measured two minutes after release. The difference between this distance and 2 inches was called the set. The specimen was then stretched to rupture and the increase in the distance between the bench marks was called the elongation.

All tests were made in a special rubber testing machine in which the rate of separation of the grips is 20 inches per minute.

All specimens were the full section of the insulation. Care was taken to remove it from the wire without injury—this being accomplished by the use of mercury. The specimens were taken from the test samples after the high voltage tests had been made.

SUMMARY

Hours	Temp., deg. F.	Average tensile strength, lb. per sq. in.			Average set, inches in 2 inches			Avg. elongation, inches in 2 inches		
		S	V	T	S	V	T	S	V	T
Initial	..	440	..	..	0.15	..	..	4.0	..	..
750	120	400	395	355	0.18	0.17	0.19	4.2	3.95	3.65
	150	325	295	313	0.26	..	0.19	2.1	2 9	3.85
	180	225	295	245	..	..	..	1.55	3.95	1.6
1500	120	320	320	290	0.23	..	0.19	2.3	1.85	3.3
	150	255	50	280	..	..	..	1.25	1.35	1.1
	180	210	..	245	..	..	..	0.6	..	0.75
3000	120	290	270	285	0.20	0.21	..	2.9	3.0	2.1
	150	250	245	260	..	..	..	1.5	1.3	1.5
	180	260	320	265	..	..	..	0.25	0.35	0.3

Note:—"S"=stationary; "V"=vibrated; "T"=twisted.
"S.B."=slow burning insulation; "R"=rubber insulation.

Summary of Bending and Twisting Tests

The purpose of these tests was to show in a simple manner how the two kinds of insulation would withstand bending and twisting treatment after subjection to the high temperature. Since the specimens which were vibrated were subjected to the most severe conditions, the tests were made only on those specimens.

In the bending test, a piece of one of the specimens, 3 inches long, was cut off and then bent sharply until the insulation began to crack at the bend. The pieces were then suitably mounted side by side in such a manner that direct comparison could be made, and photographed. This photograph (Fig. 6) shows clearly that the slow burning insulation could not be bent in any case as sharply as the rubber insulation.

The twisting test was made on pieces 3 inches long. One end was held in a vise (½ inch in jaws) and the other end twisted with a pair of pliers (½ inch in jaws). In the case of the rubber insulated wire, when the braid broke it was carefully cut away at the break and the twisting continued until the rubber broke. The results of this test are shown in the following table

	Turns at Failure					
	120°F.		150°F.		180°F.	
Hours in Oven	S. B.	R.	S. B.	R.	S. B.	R.
750	1¼	3*	1¼	2	1	1
1500	1¼	3*	1	1	¾	1
3000	1	3*	½	1	¼	1

Note:—"S.B."=slow burning insulation; "R"=rubber insulation.
* If specimen withstood three turns, the test was discontinued.

Conclusions

The results of the tests which are described and recorded in this report show that:

(1) The dielectric strength of the rubber insulation is *at least* double that of the "slow burning" insulation under all of the various test conditions, and is probably considerably more than double because the puncture value of the rubber insulated wire could not be obtained on account of flashing around the ends of the wires.

(2) The effect of the most severe test made, namely 3000 hours at 180 deg. fahr. with continuous vibration, was practically negligible for both kinds of insulation as measured by the effect on the dielectric strength.

(3) The effect of this most severe test on the physical strength of the two insulations, as measured by noting the amount of bending and the amount

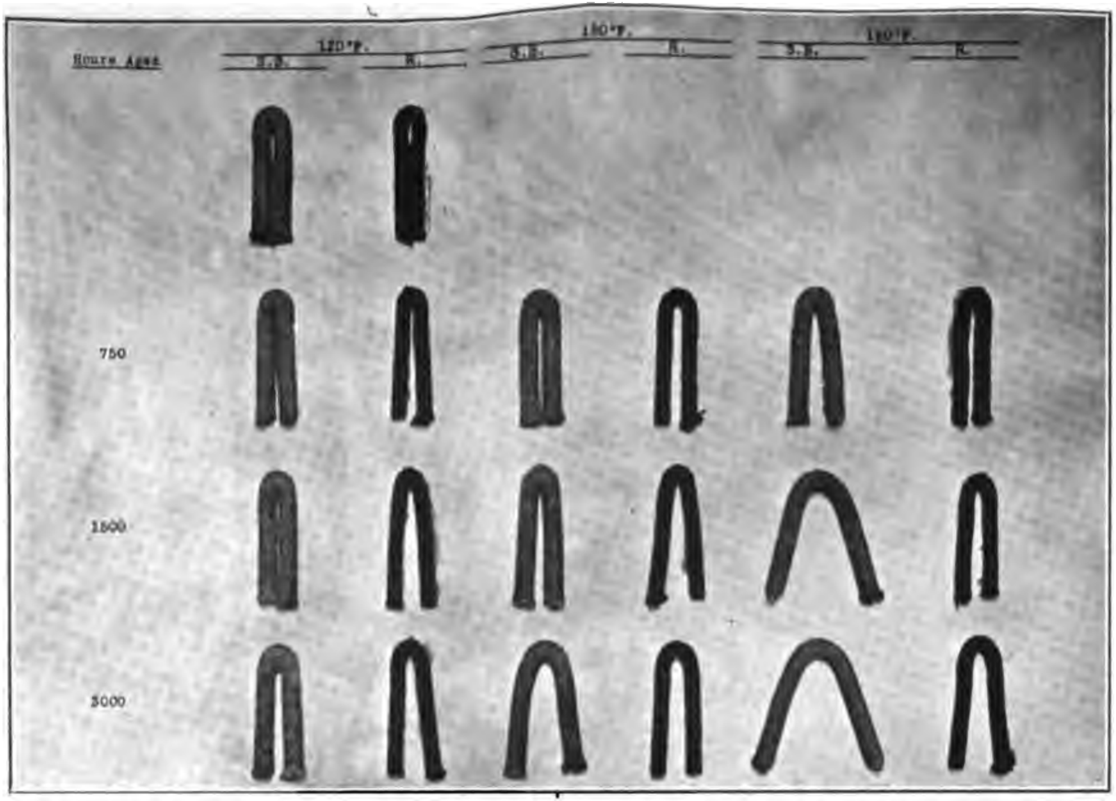

Fig. 6—Angle at First Crack in Bending Test

of twisting which short specimens would withstand, is appreciably more marked in the case of the "slow burning" insulation than in the case of the rubber insulation.

(4) The rubber insulation, after subjection to a temperature of 180 deg. fahr. for 3000 hours and continuous vibration, still had over half of its original tensile strength.

These tests involve the principal deteriorating elements which would be encountered in high candle-power lighting fixtures. The severity of the test is undoubtedly much greater than would be encountered in practice. Nevertheless, the results show very conclusively that the rubber insulation would be *at least as satisfactory* as the "slow burning" insulation. Those differences which were found in the tests, although perhaps not very important, were in favor of the rubber insulation. Even after 3000 hours at 180 deg. fahr., and with the specimens subjected to continuous vibration, the rubber insulation still had a very considerable amount of elasticity, an amount which would insure without question any actual breaking of the insulation due to any ordinary mechanical treatment. Furthermore, it is to be noted that although the insulation resistance between conductors when installed under the conditions found in lighting fixtures is not likely to be of great importance because such wire is normally always dry, still if by chance moist conditions were ever encountered it is perfectly obvious that the rubber insulation would be markedly superior to the "slow burning" insulation.

Summarizing very briefly, therefore, it would appear that there is no question that rubber covered wire would prove to be at least as reliable and probably more reliable in large-unit fixtures than "slow burning" wire.

Date of report, Aug. 30, 1917.

APPENDIX III

This appendix is the first progress report of the Electrical Testing Laboratories on the investigation being conducted under the direction of the Wiring Committee to determine the relative durability of various types of electric wiring under various conditions.

General Purpose of Investigation.

The general purpose of this investigation is to obtain definite, quantitative data concerning the durability of various types of wiring in various types of building construction under various conditions. The investigation is being carried on in two parts, (a) laboratory tests and (b) examination and tests of samples of wiring removed from old structures together with the collection of data and information relative thereto. Relatively little has been done on the latter part of the program on account of the war.

Laboratory Tests.

While it is, of course, impossible to duplicate in the laboratory all of the conditions which are found in practice or to provide typical installations of any size, still it was believed that short specimens of different kinds of wiring systems buried in various types of building construction would give sufficiently definite information in regard to the durability of wiring systems to justify the expense involved.

About eighty specimens of various types of wiring, each about 8 feet long, were prepared, using in each case standard "new code" rubber covered, No. 14 B. & S. wire. Where a type of building construction was to be duplicated, a column of the material about 6 inches square and 8 feet long was made and the wiring installed therein.

About fifty of the test samples are stored in racks in a specially prepared room, which is always thoroughly dry. About thirty test specimens are stored on specially constructed galvanized iron racks in a closed room, which is kept damp by a thorough wetting two or three times a week. Fig. 1 is a photograph of the

Fig. 1—Samples Kept Dry

Fig. 2—Samples Kept Moist

"dry" test samples and Fig. 2 of the test samples which are kept damp.

Description of Samples.

The following is a description of the samples which were prepared and "installed" in April, May and June, 1917, together with the test numbers, which serve as an index in the test data. All mason work was done by a "professional" mason, using standard methods of mixing and preparing the various materials. All concrete was made with a mixture of 1 part cement, 2½ parts sand and 5 parts small broken stone. The plaster was 1 part lime and 4 parts sand. The plaster prepared for use at low temperatures had added to it one-half ounce of calcium chloride per specimen (i.e., per 10.7 cubic feet of plaster). The concrete samples were 6 inches by 6 inches and the plaster samples were 4 inches by 4 inches.

Description of Samples

Samples kept dry

Test
No.

1 Concrete made with broken stone; standard duplex wire pulled in after setting through hole formed in concrete.
2 Ditto; lead covered duplex wire.
3 Ditto; flexible steel conduit.
4 Ditto; circular loom.
5 Concrete made with coal ash; standard duplex wire pulled in after setting through hole formed in concrete.
6 Ditto; lead covered duplex wire.
7 Ditto; flexible steel conduit.
8 Ditto; circular loom.
9 Concrete made with broken stone; standard duplex wire in position.
10 Ditto; lead covered duplex wire.
11 Ditto; flexible steel conduit
12 Ditto; circular loom.
13 Ditto; solid steel conduit.
14 Concrete made with coal ash; standard duplex wire in position.

15 Ditto; lead covered duplex wire.
16 Ditto; flexible steel conduit.
17 Ditto; circular loom.
18 Ditto; solid steel conduit.
19 Brick with lime mortar; standard duplex wire in position
20 Ditto; lead covered duplex wire.
21 Ditto; flexible steel conduit.
22 Ditto; circular loom.
23 Ditto; solid steel conduit.
24 First quality, clear pine free from sap; standard duplex wire.
25 Ditto; lead covered duplex wire.
26 Ditto; flexible steel conduit.
27 Ditto; circular loom.
28 Wood, very sappy and wet; standard duplex wire.
29 Ditto; lead covered duplex wire.
30 Ditto; flexible steel conduit.
31 Ditto; circular loom.
32 Lime plaster; standard duplex wire in place after setting.
33 Ditto; lead covered duplex wire.
34 Ditto; flexible steel conduit.
35 Ditto; circular loom.
36 Lime plaster; standard duplex wire in position.
37 Ditto; lead covered duplex wire.
38 Ditto; flexible steel conduit.
39 Ditto; circular loom.
40 Ditto; solid steel conduit.
41 Plain wire in air.
42 Lead covered wire in air.

Samples kept wet

51 Concrete made with broken stone; standard duplex wire in position.
52 Ditto; lead covered duplex wire.
53 Ditto; flexible steel conduit.
54 Ditto; circular loom.
55 Ditto; solid steel conduit.
56 Concrete made with coal ash; standard duplex wire in position.
57 Ditto; lead covered duplex wire.

58 Ditto; flexible steel conduit.
59 Ditto; circular loom.
60 Ditto; solid steel conduit.
61 Brick with lime mortar; standard duplex wire in position.
62 Ditto; lead covered duplex wire.
63 Ditto; flexible steel conduit.
64 Ditto; circular loom.
65 Ditto; solid steel conduit.
66 Lime plaster with calcium chloride; standard duplex wire in position.
67 Ditto; lead covered duplex wire.
68 Ditto; flexible steel conduit.
69 Ditto; circular loom.
70 Ditto; solid steel conduit.
71 First quality, clear pine free from sap; standard duplex wire.
72 Ditto; lead covered duplex wire.
73 Ditto; flexible steel conduit.
74 Ditto; circular loom.
75 Wood, very sappy and wet; standard duplex wire.
76 Ditto; lead covered duplex wire.
77 Ditto; flexible steel conduit.
78 Ditto; circular loom.
79 Plain wire, in air.
80 Lead covered wire, in air.

Tests.

It was originally intended to make an insulation resistance measurement, a high voltage test and a mechanical test of the rubber insulation every six months. This was not found practicable or necessary because the deterioration is so slow, and therefore tests will not be made more often than once a year. It may be found that once in two years will prove sufficient.

The insulation resistance measurements are made by the standard series galvanometer method with a potential of about 800 volts. Each conductor of a pair is measured to ground and the average is reported. The mechanical tests are made on 6-inch specimens (a piece of the entire sample, about 8 inches long, being removed at the test intervals for that purpose) in the usual manner with a standard testing machine, the specimen being stretched at a rate of 20 inches per minute and the load being noted at rupture. The elongation is the stretch at rupture, in a length of 2 inches at the center of the specimen.

No high voltage tests have been made as yet because all samples would withstand any reasonable voltage. It is proposed to make this test after about three years by applying 2,000 volts to the 8-inch test specimens of wire removed for the mechanical test before the latter is made.

Test Results

The following is a summary of the test results after about eighteen months. No mechanical tests were made before eighteen months because it was obvious that no appreciable deterioration would take place within that interval. For a description of the samples refer to the corresponding number under "Description of Samples." No. 1 to 42 inclusive are "dry," 51 to 80 inclusive are "wet."

TEST RESULTS (March, 1919)

Notes: Average initial tensile strength, 410 lbs. per sq. in.
Average initial elongation in 2 inches, 4.1 inches.
"Meg."=megohm miles; "T.S."=tensile strength, lbs. per sq. in.:
"Elong."=elongation in 2 inches.

Open wiring ("knob and tube" type)

	Time Elapsed				
	Initial	8 Mo.	18 Mo.		
Test No.	Meg.	Meg.	T. S.	Elong.	Meg.
41	5025	3640	1145	7.6	....
41a	6700	2120	1075	7.4	2800
79	2750	9900	425*	3.8*	2200
79a	4130	840	1275	7.6	400

*Test specimen probably defective

Plain wire in concrete, plaster, etc.

1	1400	495	375	3.8	600
5	4190	1430	405	3.5	840
9	1260	2340	335	3.1	1170
14	860	393	335	2.9	525
51	6430	9250	445	3.7	13
56	....	3085	390	3.3	29
[illegible]	895	445	405	3.3	765
61	....	14	465	4.6	2.9
32	1420	908	365	4.0	748
36	2840	734	375	3.1	748
66	3214	11100	425	4.4	159

Lead covered wire in concrete, plaster, etc.

	Time Elapsed				
	Initial	8 Mo.	18 Mo.		
Test No.	Meg.	Meg.	T. S.	Elong.	Meg.
2	105	75.3	425	3.2	34
6	400	16.1	430	3.3	11.1
10	39	16.9	410	3.0	19.8
15	42.5	6.9	425	2.9	600
52	....	4.7	385	3.6	1.9
57	2295	5550	410	4.0	8.6
20	474	10.4	420	3.7	9.9
62	3670	4625	430	4.1	7.5
33	995	631	360	3.8	748
37	92	8.5	420	2.9	10.2
67	....	0.835	410	3.9	2.2
42	1175	682	335	3.5	2100
42a	677	425	350	4.0	1170
80	8265	14800	385	4.8	3300
80a	4130	5550	390	4.2	330
25	895	666	330	3.3	748
72	1769	5550	385	4.3	209
29	38	6.9	435	3.1	30
76	3675	8020	365	4.3	129

Flexible metallic conduit in concrete, plaster, etc.

3	1120	393	405	3.9	600
7	5025	969	400	3.5	525
11	1400	384	380	3.7	435
16	1400	1213	420	3.9	600
53	11020	7400	410	4.0	32.5
58	8265	4935	440	4.2	108
21	2235	429.5	435	3.7	720
63	11020	7400	420	4.2	....
34	2550	818	370	3.4	630
38	3410	865	320	2.8	630
68	2755	11100	395	4.0	329
26	895	682	400	3.8	818
73	6885	4350	435	4.6	255
30	766	462	400	3.7	480
77	8265	2910	430	4.2	112

Circular loom in concrete, plaster, etc.

4	1039	409.5	410	3.8	480
8	1175	1815	420	4.0	490
12	1510	316	420	3.4	630

Circular loom in concrete, plaster, etc. (cont'd)

	Time Elapsed				
	Initial	8 Mo.	18 Mo.		
Test No.	Meg.	Meg.	T. S.	Elong.	Meg.
17	980	1365	415	3.6	765
54	5510	365	430	3.7	2
59	5510	5550	415	4.1	36.5
22	1510	409.5	430	3.7	600
64	....	11100	425	4.2	17.4
35	1985	591	380	3.1	748
39	3410	1129	390	3.8	748
69	11020	11100	450	4.1	172
27	1260	757	405	3.6	585
74	4130	11100	445	4.6	248
31	1705	823	400	3.8	630
78	11020	7400	430	3.7	181
Rigid pipe conduit in concrete, plaster, etc.					
13	614	461	405	3.6	630
18	545	606	385	3.2	600
55	2750	14800	400	4.0	3.3
60	6835	4625	400	3.8	156
23	659	562	410	3.9	1430
65	7345	5550	430	4.4	....
40	639	585	375	3.3	515
70	8265	7400	400	3.9	223
Wood moulding					
24	840	666	375	3.8	585
71	4590	5550	400	3.5	170
28	1476	623	390	3.7	585
75	6430	4440	435	4.0	211

Remarks.

In studying the above data, it should be remembered that the measurement of the insulation resistance of such short lengths of wiring, particularly where the samples are damp, involves great difficulties, so that the results are approximate only and may not be consistent from one measurement to the next. However, any marked *relative* deterioration ought to be shown by the general trend of the test results after several years have elapsed.

Similarly, in the mechanical tests, only one piece of wire can be tested at a time, and as the insulation may be injured slightly in removing it from the conductor, there may be inconsistencies between adjacent tests. But taken over a considerable period of time, the general *relative* trend of the test results should indicate any change in the insulation.

After sufficient data have been collected in this test and from samples of wire from actual installations (twenty-one samples have been received and tested to date), it is proposed to summarize the performance of the various types of wiring in the form of a chart marked off in squares. Time will be read along one side and kind of wiring along the other, the deterioration from the initial or normal value being indicated in the squares.

THE CHAIRMAN: Gentlemen, the report of the Committee on Wiring is open for discussion. On account of the lateness of the hour we will limit three minutes to a speaker.

F. D. PEMBLETON, Newark, N. J.: I should like to call the attention of the members present to the reference to the little pamphlet on the safe use of electric appliances. At a meeting of the Executive Committee in the latter part of 1916 or the early part of 1917, representatives from the Board of Fire Underwriters were present for the purpose of discussing methods which they had used to acquaint people with the danger of using electric appliances in the wrong manner. Their method was to publish full column articles in the newspapers setting forth the damage that had been done by electric appliances. They were willing to stop such methods and follow a more conservative method, to show people how to use appliances properly, providing the Commercial Section would undertake such work.

Following that meeting the Publications Committee published a small pamphlet showing the right and the wrong way of using electric appliances, and the entire edition was taken by a number of different companies. Now, this year, in a further effort to promote this educational work, the Publications Committee has published another pamphlet which in a pictorial way, as well as with text matter, tells the entire story of the right and the wrong way of using the principal electric heating appliances which might make trouble.

This pamphlet is published purely in an effort to serve the industry and not in any sense to make money, as it is sold practically at cost. The pamphlet can be seen at the registration booth where you may leave your orders for it, and I strongly urge that all of the men present place their order at the earliest convenience, so that the orders may be given to the printer, and the pamphlets circulated as soon as possible.

I should like to point out to you that if the Commercial Section, or the member companies, do not take some real definite action to educate the people regarding the proper and careful use of electric appliances, without scaring the people regarding them, then we must expect from the Board of Fire Underwriters a less careful presentation of the subject in a manner that may do the sale of appliances a great deal of harm.

A. A. PACKARD, Middletown, Conn.: I wish to take exception with the Committee on its remarks concerning portable cord, and also with a certain part of its report concerning the National Electrical Code. In my city we have recently conducted a house-wiring campaign which has increased the number of our residential customers approximately forty-four per cent, and in putting this campaign across we experienced more or less difficulty in getting the contractors to do the proper kind of wiring, because of the vast volume of work which they were doing. Had it not been for the regulations of the Code, which we took as an authority to back up our inspectors, we would have some very poor wiring conditions in this city, especially in this matter of portable cord.

Many house owners consider themselves capable of doing their own electrical work, and in this connection I wish to call especial attention to the misuse of the ordinary flexible cord. We have actually found cases where common flexible cord has been run along ceilings, through partitions, and even run along base-boards and fastened with ordinary chicken-wire staples. Flexible cord was never intended for such purposes, should not be used in damp places, hung on nails, nor stapled to woodwork; but unless the central station inspector or the municipal inspector has some recognized authority on which to base his arguments against such improper usage, conditions are bound to be most unfortunate.

In the matter of using smaller wire for house-wiring purposes, it appears practically impossible for any inspector, either central station or municipal, to keep in close enough contact with the consumers to anticipate the load on any particular circuit at their residence or place of business. If, then, the original wiring installation is inadequate and the time comes when the circuit is loaded beyond the carrying capacity of the wire, trouble of the most serious nature will develop. Small wire is also subjected to a greater voltage drop than larger wire, and it is well within the realm of possibility that we might have the consumer coming back to the central station with complaints of poor service, which complaints under these circumstances would be both justified and unjustified. They would be justified if the central station did not insist on the proper size of wire, and unjustified because of the consumer's false economy in putting in a cheap installation, when at slightly greater initial cost, wiring could have been obtained capable of giving the proper kind of service. It is my feeling, and I believe the feeling of the community from which I come, that the Code rulings are not excessively severe. Some of these rulings we are not insisting upon to the letter, but in so far as it is possible, we are asking the contractors and the public to live up to them, because it is our firm belief that in so doing we are protecting the best interests of our customers, which in my opinion is one of the fundamental obligations of the central station.

Mr. Hale: I would like to answer this suggestion right away. The Committee does not in the least object to the provisions of the present codes which forbid unsafe methods. We believe they should be thoroughly enforced, and the only thing that we object to is that a great many perfectly safe methods are forbidden by the present codes.

The same way in regard to wire. We do not in the least object to the use of 14 or 10 or 12 or any size wire that ought to be used. We should always use wire big enough to carry the load, and in general it is good engineering to put in a little bigger wire than is necessary.

All that we suggest is that in the cases—they are not very frequent, but they do occur—in the cases where 18 wire is ample to carry the load it should be allowed.

It is allowed in other countries, and is allowed here for extension cords; and if you will only think of the real result of the rules you can see that the rules now do not forbid 18 wire, but say that when it is used it must not be protected against mechanical injury by being put in moulding or conduit or otherwise protected. This sounds absurd, but is the actual fact. Put a No. 18 wire loose on the floor to feed a flat-iron, and the code approves it. Put that *same* wire in a conduit to carry a single lamp, and the code condemns it.

A. G. deClercq, Chicago: I have had considerable opportunity to observe wiring which has been installed. Wire just large enough to carry the load is all right in special cases, but when a house is wired for the ordinary load and later on the customer adds various appliances to the socket, the installation will be overloaded. For instance, if No. 16 or No. 18 wire is installed for the ordinary lamp, within two or three months after it is completed it may be carrying a flat iron, a washer and a heater. You will find not only one, but thousands of cases of this kind.

In cases of trouble (customers' complaints) where a circuit should be fused to about six amperes, we find them using twenty ampere fuses; in other words, there is practically no inspection after the wiring is installed and for the sake of the load of the central stations and the manufacturers of appliances, I think the tendency should be largely towards 600 watt sockets and No. 14 wire fused to capacity.

People know very little about electricity and think that if they have a socket on the wall which they can reach from the floor or a chair, they can connect on the circuit anything that they can screw into that socket. Furthermore, there are a number of two and three way devices that connect to a lamp socket. I have seen cases of a flat iron and a washing machine being connected in addition to the lighting where fixtures are wired with ordinary No. 18 wire.

There is another point against passing rules to use smaller wire. There are a number of contractors—and I handle the construction end of our business—who will live up to rules and use judgment as to where the good work should be installed, but there are a large number of men who will do anything to get a job. In other words, they will take it at a price for which they could not do decent construction work and will use the very lightest material that they can manage to slip in.

I think that the tendency towards using lighter construction is going to hurt the electrical business in every branch.

A MEMBER:* I think that Mr. deClercq and the gentleman before him admirably presented the question of large size wire, but I think you might be interested to know that we persuaded the contractors—not doing the business ourselves—to mark in their bids to prospective wirers, or persons in process of wiring their houses, that if they will exceed the minimum with No. 12 wire, which wire will insure a sufficient carrying capacity, the cost will be an addition of such and such a sum, which cost will be a nominal one. This permits the possibility of our being able to sell the toasters, flat irons, and various appliances for use in connection therewith.

S. W. BORDEN, Summit, N. J.: I would just like to add the advice of a little company. I think if there is going to be any change in the present No. 14 standard, it wants to go to No. 12, and no loophole should be left open at all for anything less than No. 14 getting into the system.

I would also like to say to the Committee that the idea of a standardized set of rules and regulations is, to my mind, something that certainly ought to be pushed and carried through. It would be a great advantage. It would be much easier to get the commissions to accept those rules, if they were standard, and they would appeal to the customers. If the customer can be assured that such and such a regulation is standard all over the country, his objections will usually disappear.

E. A. EDKINS, Chicago: Some of the matters referred to in the Wiring Committee's Report must not only be a source of discouragement to the Committee, which has worked unremittingly and conscientiously for years in an endeavor to encourage all constructive efforts toward the improvement and simplification of the wiring art, but they also reveal conditions which are rather stultifying to us as a National organization. Here we have a situation in which an industry which runs into millions

* Unable to ascertain member's name.

of dollars annually is rigidly and arbitrarily governed in its operations by general codes prepared by an outside organization representing nothing more or less than the insurance interests, and in the preparation of these codes the opinion of our own experts receives very little consideration.

I will not attempt to discuss this point further, but there is just one other point that occurs to me, which is not only common to this report but to all of the reports presented by the Commercial Section containing either definite or general recommendations; I think it is most discouraging to the men who prepare these reports that the reports are received here and filed and that is about the last that is heard of them until the following year, when the recommendations may be referred to or resurrected in subsequent reports, only to share the same fate. It seems to me that one of the most important things that we should work on as a Section is to develop some kind of machinery in our own National body, by which these definite recommendations shall be taken up subsequently by the parent body and acted upon in some definite way. Otherwise we are simply milling around in a circle, making recommendations which never get anywhere.

I should like to ask that the incoming administration in the Commercial Section take this question up very seriously and see if it cannot give the men who are preparing these reports a little more backing.

THE CHAIRMAN: Any further discussion?

W. H. BLOOD, Boston: Mr. Chairman, I am very much interested in this report. It contains a great deal of constructive criticism. It also contains, I am very sorry to say, a strain running through sections of it which I would call a tendency to Bolshevism, intellectual Bolshevism, if you please, and the more insidious because it is intellectual. Many of the statements in it are nearly true. They read something like the Hearst editorials which are so hard to refute because they are cunningly worded and almost tell the truth.

You know, I am sure, that the National Electrical Code is really the property of the Underwriters; it is used as their means of enforcing premium rates. True, they do not always live up to it; true, they waive it, but primarily the National Electrical Code is the property of the Underwriters. We do not have to follow it unless we wish. None of your buildings has to be wired the way the Code prescribes, unless you see fit to do so; but you can't, in general, get those buildings insured, unless the wiring is done in accordance with those rules.

Those rules are made up by an intelligent body of men who have had a great deal of field experience, who have the fire data in their hands, and who are in a position to tell what they consider is safe practice. You are not obliged to follow them unless you like. In general, the National Electrical Code, I think, is a wonderful document. Certainly with it in existence conditions are much better than the chaos which we had some years ago. Some of you probably do not remember it; there were at one time some twenty-six, I think, or possibly it was twenty-nine sets of codes. These were all consolidated into what is now the National Electrical Code.

Let me take up one or two specific points in this report, if I may. On page 31 the Committee speaks about the standardization of the insulation on cord and says it is a good thing. In the next paragraph it deprecates standardization of ranges. Two pages further it says any old thing as long as it is safe is good practice. These statements do not hang together. Do we want standardization, or do we not? Certainly ranges should be standardized, and I see no reason why we should not standardize cord. We have been through the non-standardization of lamp sockets. You all remember the time we had and how gladly we received the standard socket. Would you go back to three or four types of lamp sockets?

Turning to the question of flat irons, the Committee has not emphasized sufficiently the dangers of that device. It is no secret, I think, that the Underwriters are now having to pay the losses on flat iron fires at the rate of 100 per day in this country. It is a startling amount. It is true many of them are incipient fires, but an incipient fire may grow to any proportion. The question of whether the flat irons are connected to a socket or not, it seems to me, cuts no figure; the fact is that the fires originate in the flat irons themselves; and the education of the public alone is not sufficient to prevent these fires. Other steps must be taken. The manufacturers must get busy and put on the market some kind of an automatic device to cut off the current before the iron sets fire to its support. There are one or two which have been developed, which will automatically cut the current off when the flat iron gets too hot. The electric iron will get a bad name unless some device of this kind is developed and generally used.

Now, taking up the question of concentric wiring, I advocated very strongly before this assembly a few years ago the use of concentric wiring. I find I was misled. I wish to apologize at this meeting. The use of concentric wiring, across the water, is not in accordance with our practice. It is not at the present time, in my opinion, usable for general central station work; it may be all right, however, in certain isolated cases. There are probably developments of the concentric wiring which may be and should be considered and used in this country. The National Fire Protection Committee is willing at all times to receive suggestions, and I believe would welcome any new forms of wiring which would reduce cost, but these new forms must be safe.

On the solid neutral the Committee has come across beautifully, and the rules have been modified from time to time so that now there is only one fuse on a grounded neutral. The concensus of opinion of the Committee's experts and its field men is that that fuse should be retained.

Referring to the paragraph in the report which considers the size of wires, I think it has been brought out very conclusively here by the former speakers that the discussion in the report is more or less academic and is not in accordance with field practice. When you say that any safe wiring ought to be used, you are getting into the realm of speculation. We have got to have a code and we have got to live up to it. That code should be revised as fast as experience demonstrates that it is feasible. The principle laid down in the report, that every man is considered innocent until proven guilty may be all right as far as men are concerned. It is not all right as far as wiring is concerned. Those who propose new systems must show that they are all right before the underwriters approve them, because they are the ones who pay the losses. The cooperation between the National Electric Light Association and the National Fire Protection Association is strong and it can be made stronger if constructive criticisms are passed in to me. I shall be very glad to forward them; I am in a position to do so; and constructive work is what the Electrical Committee of the National Fire Protection Association wants, and not destructive criticism.

THE CHAIRMAN: Any further discussion, gentlemen? If not, Mr. Hale will close.

MR. EDDYSTONE, Wilmington, Del.: Mr. Chairman, I have no discussion, but there is one question on which I would like to have a little information, and that is what are the underwriters, who enforce this code, going to do with the screw driver electrician and the curbstoners and the insurance companies, who do not recognize nor require inspections in places where wiring is done? I would like to have some information on that.

MR. HALE: In regard to the point raised by Mr. Blood that in some cases we seem to recommend standardization, and in other cases object to it, this is exactly the situation.

The report describes different kinds of standardization, and we believe in such standardization as of screw threads and fittings; we believe in the standardization that provides for a minimum degree of quality and safety; and on the other hand we object to the kind of standardization that attempts to limit the development of new, improved and safe methods which can be used alongside the old methods.

There is hardly time to take up all the points, but I wish very definitely to combat the statement that the present code is merely for the benefit of the Underwriters, and that we are free to use any method we choose if we are willing to get along without any insurance.

I know the situation in Boston, and I think I know it in other cities: If a house is wired, no matter how safely, it is practically impossible to get it connected to the central station unless it conforms to the code.

The statement that we are free to wire houses in disregard of these provisions of the code that forbid certain safe methods, is not in accordance with the fact. If a man wires a house by a perfectly safe method, he may still find it impossible to use the wiring by reason of the code.

On the other hand after a house has been wired and connected, you can in practice get insurance without any regard as to whether the rules of the code were or are observed, since 99 times out of 100 the Underwriters do not make any inspection, but give the insurance without question.

The rules are not for the benefit of the Underwriters, as is shown by the fact that in practice they allow insurance of ordinary houses without any inquiry as to whether they conform to the code.

The code rules, at least as regards the cases in which they forbid constructions and methods that are perfectly safe, are for the benefit only of the vested interests that desire to discourage new and safe methods.

Louis Kalischer, Brooklyn, N. Y.: Mr. Chairman, may I answer that proposition? I am not a central station man; I happen to be a contractor; I am very much amused, and with your permission I would like to have just about half a minute. The one point that was missed by the gentleman at the left here with reference to the Code is this: I am living next door to him and wire my house in an imperfect manner. The only restrictions or restraining influence that the underwriters have is to increase the insurance rate. They also increase the rate on his house because of this imperfect wiring. My house becoming a fire hazard necessarily increases the danger to his property. It is not the part of the contractors, nor is it their desire or wish, to do unworkmanlike or inferior wiring. They oppose and have always opposed concentric wiring, because this class of work is bound to bring in a so-called curbstoner or screw-driver electrician. There are enough of what are termed rotten jobs throughout the country now, and the best wire and material that a man can buy are the cheapest in the end. There never was a building operation that was retarded or abandoned because of the cost of the wiring. No building operation was ever increased more than two to two and a half per cent by the installation of the best wiring you could buy.

To secure a decorative effect in buildings, the cost is increased sometimes ten to fifteen per cent on the operation. If this can be justified, surely we ought not to reduce the standard of wiring to save one, one-half, or one-quarter of a per cent of the total cost of the operation and then get an inferior or hazardous wiring job. This not only affects the owner of the building, but his neighbors as well. We must protect our neighbors as well as the public in general.

The Code is not perfect. It permits of many interpretations but if it errs it errs on the side of safety.

THE CHAIRMAN: Gentlemen, the next report is the report of the Committee on Education of Salesmen, Mr. Fred R. Jenkins, of the Commonwealth Edison Company, Chairman.

REPORT OF COMMITTEE ON EDUCATION

During the past two years, notwithstanding the abnormal business conditions, your Committee has continued the Courses in Commercial Engineering and Practical Electricity along the established lines.

The continuance of these courses was considered necessary for two reasons; first, the Committee had accepted payment in advance for complete courses, and felt obligated to carry out its contract; second, your Committee believed that in such times as these, when the organizations of our member companies were seriously impaired by enlistments and draft, these courses, which were specially prepared for the education and training of new employees, would be extremely valuable, and that they should be used for the training of new employees to take over the work of those who had been called into the service.

During this period the courses were conducted at a minimum of expense, no extensive advertising campaigns being conducted, which was in accordance with the general policy of the Association.

Some of our member companies appreciated the value of these courses of intensive emergency training of new employees, and we feel they were justified in the results they obtained. A larger number of our companies, however, owing undoubtedly to many other difficulties caused by the war, did not take advantage of these courses for training purposes.

Notwithstanding these conditions during the war period, the courses have been maintained on a self-supporting basis.

On account of entering the service, a large number of our subscribers discontinued their work on the courses, but many of them have since returned and have resumed it, and it is anticipated that the percentage of those completing the courses will become normal in the course of the next year.

Shortly after the rather abrupt ending of the war on November 11th, last year, both the member companies and their employees showed a renewed interest in the courses, indicating that they considered them of value during the present reconstruction period.

Manuscript of this report was received March thirty-first.

Your Committee, therefore, considered it advisable to start a comprehensive campaign, advocating the use of the courses to assist the member companies in putting their organizations back on a permanent basis.

In order to save both time and expense, the Committees on Education of the Commercial and Accounting Sections combined in conducting a campaign starting February 1st, covering the two Commercial Courses and the two Accounting Courses. We were thus enabled to divide the territory among a larger number of committee men, who carried on the work in their territory for subscriptions to any N.E.L.A. course, either Accounting or Commercial, thereby reducing the cost to both Sections and avoiding the annoyance and difficulty of having two separate campaigns. All special campaign literature, such as posters, etc., combined all N.E.L.A. courses, but separate booklets were used for the two Sections.

Each member of the committee conducting this campaign first took up with the list of companies furnished him the use of these courses for their employees, and requested the appointment of someone in each company to act as Educational Director and to represent the company and the Association in bringing the courses before its employees. This company representative was sent samples of pay envelope slips, each one showing a different method by which the member companies could support the courses and assist their employees in becoming subscribers.

The representative was urged to get the approval of his company on one form of pay envelope slip, which the Association would furnish in sufficient quantities for inserting in the pay envelopes of all the company's employees. These slips would contain the name of the company and the name of the representative, and for identification purposes were printed in different colors.

The illustrations show the four forms from which the companies could make their selection of pay envelope slips. The first cut shows the reverse side of all slips, giving a general outline of the courses and prices. The other cuts show the front side of the various forms. These slips measure 8 inches by 3½ inches.

This campaign has not been completed, but where the compa-

Educational Courses of the National Electric Light Association

THESE courses are carefully prepared by specialists and edited by committees composed of men of long experience in the Electric Utility business. In each course the subject is treated in a practical, thorough manner, and the lessons are written in simple, plain language without the use of high sounding obscure phraseology or unnecessary technical discussions, which tend to confuse the student of a correspondence course.

Course in Practical Electricity

This course of ten lessons is prepared for practical men who are engaged in the Electric Utility business, and covers a selection of subjects which will give the best knowledge of the necessary fundamental principles. The lessons are written without the use of advanced mathematics, and are easily understood by the non-technical man. This course will help you increase your earnings regardless of the department in which you are now employed. Full course—$12.00.

Commercial Engineering Course

This course of seventeen lessons is prepared particularly for men who want to learn the commercial side of the business, and covers thoroughly and completely the selling end of the industry in all its branches. It is practically the only method in print of teaching new employees the business of the Central Station, and there are very few old employees who can not profit greatly by this course. Full course—$15.00.

Elementary Accounting Course

This is a mercantile course of seven lessons, covering fully the fundamental principles of bookkeeping and accounting. It is thoroughly equipped with questions and exercises and with all necessary account books and necessary material for a thorough elementary course. It has been especially adapted as a preparatory course for the Advanced Course in Electric Utility Accounting. Full course—$16.00.

Advanced Course in Electric Utility Accounting

A highly specialized course in Electric Utility Accounting of 16 lessons, covering all phases and the best modern practices of our most progressive companies. It follows the Association's Classification of Accounts and Public Service Commission requirements. It is complete with necessary books and special material. Full course—$65.00.

Combination price for both accounting courses—$70.00

A CERTIFICATE from the Association is awarded to those who satisfactorily complete any of the above Courses

(See Other Side)

FIG. 1—REVERSE SIDE ALL FORMS

Form A

(Name of Company printed here)

Educational Courses of the National Electric Light Association

Training is Essential for Success

The Electric Utility business has and will offer exceptional opportunities for trained men. Your advancement will depend upon your knowledge of the business.

The Company makes the following offer to help you gain a better knowledge of the business.

The Company will **advance** your tuition fee to the Association, permitting you to repay it on the following monthly basis. The Company agrees to **refund** to you all of your tuition fee upon satisfactory completion of the course while in its employ.

	Tuition Fee.	Monthly Payment.
Course in Practical Electricity	**$12.00**	**$2.00**
Commercial Engineering Course	**$15.00**	**$2.00**
Elementary Accounting Course	**$16.00**	**$2.00**
Advanced Accounting Course	**$65.00**	**$5.00**

Make a profitable financial investment of your spare evenings

Mr. (Name) representing the Company and the Association will give you special booklet on any course, advise with you and arrange for your enrollment.

Courses open to all employees of this Company.

DO IT NOW—Prepare for the Reconstruction Period

(See Other Side)

FIG. 2—FORM A

Form B

(Name of Company printed here)

Educational Courses of the National Electric Light Association

Training is Essential for Success

The Electric Utility business has and will offer exceptional opportunities for trained men. Your advancement will depend upon your knowledge of the business.

The Company makes the following offer to help you gain a better knowledge of the business.

The Company will **advance** your tuition fee to the Association, permitting you to repay it on the following monthly basis. The Company agrees to **refund** to you one-half of your tuition fee upon satisfactory completion of the course while in its employ.

	Tuition Fee.	Monthly Payment.
Course in Practical Electricity	**$12.00**	**$2.00**
Commercial Engineering Course	**$15.00**	**$2.00**
Elementary Accounting Course	**$16.00**	**$2.00**
Advanced Accounting Course	**$65.00**	**$5.00**

Make a profitable financial investment of your spare evenings

Mr. (Name) representing the Company and the Association will give you special booklet on any course, advise with you and arrange for your enrollment.

Courses open to all employees of this Company.

DO IT NOW—Prepare for the Reconstruction Period

(See Other Side)

FIG. 3—FORM B

Form C

(Name of Company printed here)

Educational Courses of the National Electric Light Association

Training is Essential for Success

The Electric Utility business has and will offer exceptional opportunities for trained men. Your advancement will depend upon your knowledge of the business.

The Company makes the following offer to help you gain a better knowledge of the business.

The Company will **advance** your tuition fee to the Association, permitting you to repay it on the following monthly basis.

	Tuition Fee	Monthly Payment
Course in Practical Electricity -	**$12.00**	**$2.00**
Commercial Engineering Course -	**$15.00**	**$2.00**
Elementary Accounting Course -	**$16.00**	**$2.00**
Advanced Accounting Course -	**$65.00**	**$5.00**

Make a profitable financial investment of your spare evenings

Mr. (Name) representing the Company and the Association will give you special booklet on any course, advise with you and arrange for your enrollment.

Courses open to all employees of this Company.

DO IT NOW—Prepare for the Reconstruction Period

(See Other Side)

Fig. 4—Form C

Form D

(Name of Company printed here)

Educational Courses of the National Electric Light Association

Training is Essential for Success

The Electric Utility business has and will offer exceptional opportunities for trained men. Your advancement will depend upon your knowledge of the business.

The Association courses are fully endorsed by this Company, and all employees are urged to take proper advantage of this opportunity to gain a better knowledge of our business.

Make a profitable financial investment of your spare evenings.

The courses are open to all employees at the following regular prices.

	Full Course
Course in Practical Electricity -	**$12.00**
Commercial Engineering Course -	**$15.00**
Elementary Accounting Course -	**$16.00**
Advanced Accounting Course -	**$65.00**

Above prices include correction and grading of all lesson papers, and Certificate from the Association.

Mr (Name) has been appointed to represent the Company and the Association, and will give you a special booklet on any course, advise with you and arrange for your enrollment.

DO IT NOW—Prepare for the Reconstruction Period

(See Other Side)

Fig. 5—Form D

nies have used these pay envelope slips the results have been very satisfactory, as shown by the following:

Commonwealth Edison Company, Form B,
Commercial Engineering Course— 6
Course in Practical Electricity—130
Public Service Company of Northern Illinois, Form B,
Commercial Engineering Course—11
Course in Practical Electricity—66

From the above results it would appear that if the member companies would adopt this cooperative method the courses would receive the support to which they are entitled.

In conjunction with the pay envelope slips, special posters were furnished the companies to be displayed in a conspicuous place in each department, also booklets on the various courses.

The Commercial Engineering Course was inaugurated November 1, 1915, and to March 25, 1919, we have sold 1517 courses, 320 of which, or about 20 per cent, have been completed and the subscribers have qualified for a certificate.

The Course in Practical Electricity was inaugurated January 1, 1917, and to March 25, 1919, 931 courses have been sold, of which 145, or about 15 per cent, have been completed and the students have qualified for a certificate.

In both courses there are many students whose work has been interrupted, but who will undoubtedly finish later on and qualify for a certificate.

Owing to the late starting of the campaign for subscribers after the close of the war, it is recommended that a similar campaign be conducted next September, and that the Educational Committees of the Commercial and Accounting Sections combine in this campaign, furnishing to the member companies without charge the necessary posters and pay envelope slips for their employees, these to contain the imprint of the member company and the name of its representative.

It is urged that each member company adopt these courses as far as possible in rebuilding their present impaired organizations into permanent organizations, and that they give these courses the proper support. An employee taking any of these courses is worth encouragement and financial assistance, as his work will improve both in speed and accuracy, and he will work for the company's best interests, as they will become more closely identified with his own.

Employees look to their company for both advice and assistance in educational matters, believing that the results are mutually beneficial.

The Executive Committee, at its meeting on September 13, 1918, removed the additional charge of $3.00 per year to employees not individual members of the Association. This ruling has encouraged the companies to adopt these courses for their employees, and should result in a larger enrollment.

In response to inquiries, arrangements have been made for a translation of the Course in Practical Electricity into Spanish, for use in South and Central America, Cuba, Philippine Islands, and other Spanish-speaking countries. This translation is progressing, but its general use will be regulated by the number of Spanish companies which are members of the Association.

We have also received inquiries from universities and other educational institutions relative to putting the Commercial Engineering Course into book form, to be used as a textbook for classroom work. This matter will not be acted upon without a conservative estimate of the copies that could be sold in this form.

Respectfully submitted,

FRED R JENKINS, Chairman.

G G BOWEN	H R KING
W W BRIGGS	F A LEACH, JR.
J A BRITTON	R B MATEER
A W CHILDS	W T McINTYRE
RAWSON COLLIER	M C OSBORN
F A COUPAL	W S ROBERTSON
F A DELAY	C R RUDY
J F DERGE	J B SEAMAN
C S EMMERT	F J SILL
T P GAYLORD	W M SKIFF
H J GILLE	C N STANNARD
L C HASKELL	L R WALLIS
M H HENDEE	R F WHITNEY
G R JONES	C E YACOLL

MR. JENKINS: In closing, I want to call the attention of all present to the educational exhibit of the Committee at the convention. At the main entrance hall we have the booklets for all courses, and we are giving out a badge to all those who inquire for these booklets. This badge should be worn by every member of the Commercial Section in support of the courses; wearing that pin simply means that you are going back to your company and are going to take full advantage of these courses during the coming winter to improve the men in the commercial department.

THE CHAIRMAN: Is there any discussion on this paper? The time is very limited. No discussion?

W. M. HALSEY, Newark, N. J.: Has the Committee any record of the results which have been obtained by companies in the education of their employees where the companies pay all or most of the cost of the educational courses? Also a record as to the results obtained by companies which pay nothing towards the cost, the employees paying the full amount of the subscription?

It seems to me that if companies wish to make better use of their men and are interested in promoting the welfare of their own interests and their employees, they should subscribe at least half of the cost of all educational courses, thus placing the courses within the reach of the men who are studious and also giving the company direct supervision over the courses. I think under this plan the educational field will be greatly enlarged.

THE CHAIRMAN: Any further discussion?

F. C. HENDERSCHOTT, New York City: Mr. Chairman, this course has now been in effect for about five years, but the work has been seriously handicapped by the war conditions which existed. It comes right down to the plain statement of fact as to whether you can render better service with an untrained man or with a trained man. That is what the whole proposition amounts to.

Now, so far the Committee has developed only two courses; there should be at least twenty.

One large electric operating company that I know of has seventeen in its commercial school. If you can get as good a baseball player or football player without training as you can with it, then the argument is not so strong. If a person with natural musical ability is as good a musician without training as he would be with training, then the argument again is not strong.

The time has certainly come when this Committee should have full and sincere support; it should have enthusiastic support, because every member here who has studied the proposition knows that as far as this organization is concerned, the problem is one of service, and you can't give service with untrained men.

There isn't anything in the report to discuss, I think, because we agree with it, we agree with all of it. But the country just now is facing a new era, new conditions that have developed out of the war; and we are either going to take hold of this proposition and train to get efficiency, or it is inevitable that we are going to miss a very important point. It needs something more than just passing support, it needs enthusiastic support, and the Committee is entitled to it. The Chairman of the Committee has given several years of very earnest effort and of thought, and I just wish to say in this connection that you can't spend money to better advantage than by putting it into the training of your employees. It will bring a bigger return than money spent in any other way.

THE CHAIRMAN: Any further comment, gentlemen?

W. PFENNINGER: I would like to ask whether in general these courses have been pursued individually by the men of the different companies, or whether they have been pursued under the direction of an educational director, for example.

THE CHAIRMAN: Mr. Jenkins, will you answer those questions, please?

MR. JENKINS: The Committee advises strongly that the companies organize classes and appoint an educational director. There is always in any company of any size some one who is particularly fitted to carry on the educational work, and he can always get some one who is familiar with the topics of the various lessons to attend the class meetings, bring apparatus for ample demonstration, and discuss all points with the students.

Answering another question relative to the payments, the Committee believes, and I, personally, thoroughly believe, that the question of education and training of employees is fast becoming an operating proposition. A few years from now I think that we will all have to consider the question of training the employees. Training and education are one of the operating problems that we must confront, the question of whether a trained man can be obtained outside, without all this, is past argument. We have got to train; there is no question about that.

THE CHAIRMAN: The final report on the program for today is the report of the Committee on Electrical Salesmen's Handbook, Mr. R. H. Tillman of the Consolidated Gas, Electric

Light and Power Company, of Baltimore, Chairman. On account of the lateness of the hour, I have suggested to the Chairman of the Committee that the report be read in abstract, that it be brought before the Power Sales Bureau for discussion, and on Thursday we have a further discussion of the report.

MR. TILLMAN: Gentlemen, such radical changes are necessary in the construction of the Handbook that I think they ought to be considered by the large group of commercial men so that the incoming administration will have the benefit of new ideas along the line of the Handbook work. It means that considerable money will have to be spent in republishing the book, and it ought to be spent in the best method possible to give the benefit to the commercial men.

REPORT OF COMMITTEE ON ELECTRICAL SALESMAN'S HANDBOOK

In placing before the Convention its report on the Electrical Salesman's Handbook, the Committee, first of all, wishes to refer to its report submitted in 1917. Various suggestions contained in that report have never been acted upon by the Association, and the Committee, therefore, desires to include in this report a part of the 1917 report as follows:

General

"One of the problems the Committee has had to meet is the rapidly increasing size of the Handbook. It is already too bulky and should be divided up in such a way as to make it more convenient for use by the members of the Commercial Section. The book contains a vast fund of information, yet notwithstanding this, an investigation has shown that it is neither as fully appreciated nor as greatly used as it should be by our commercial members.

"The cumbersome size of the complete book and the heavy expense to the Association of supplying the entire volume to each Commercial Section member have been considered by the Committee. As any one member rarely uses more than one Section, the Committee wishes to recommend as follows:

> "That each member be furnished with a binder, and only that Section in which he is interested.
>
> "That, for the present, the Sections be divided into three parts: Lighting Section, Power Section, and Electric Vehicle Section.
>
> "That a power salesman be furnished with the Section on Electric Power, including Industrial Heating, and a lighting salesman be furnished with the Section on Lighting, including Domestic Heating.
>
> "That where a member desires a Section in addition to the one furnished him, he shall be charged for it.
>
> "That each member company shall be furnished with one or more complete volumes of the Handbook, to be placed on file for reference use.

Manuscript of this report was received March thirty-first.

"To make the material more accessible, the alphabetical index of each Section can be merged in one alphabetical index for the complete volume, if so desired.

"The Committee has already intimated in this report the possibility of its work conflicting with or duplicating the work of other committees. Under the present arrangement, the Handbook Committee is dependent upon, and its work is limited by the various Bureaus of the Commercial Section. The entire responsibility for obtaining information now rests with the Chairmen of these Bureaus. To place this responsibility properly and to facilitate the collection and publication of suitable information, the Committee desires to make the following recommendations:

> "That the Handbook Committee consist of the Chairmen of the Power Sales Bureau, the Lighting Sales Bureau, and the Electric Vehicle Section, respectively, with a Chairman to be appointed by the Executive Committee of the Commercial Section.
>
> "That each member of the Committee be held responsible for the fresh data for the Handbook from his particular Section or Bureau, although he may delegate this work in his Bureau to a sub-committee to report directly to him.
>
> "That each member of the Committee report directly to the Chairman of the Handbook Committee, and that the said Chairman, with the aid of an assistant at headquarters delegated to handle the details of the work, shall pass and decide upon the data submitted for publication.

"The Committee believes that the adoption of these recommendations will eliminate duplication of effort, facilitate the collection of proper information, greatly reduce the expense of such collection and result in a far wider use of the Handbook."

New Material

The Committee has discussed the question of the insertion of more valuable material into the Handbook and begs to submit herewith a list of subjects that should be included in order to make the Handbook of greater use to the Salesman. Some of these monographs are practically ready for printing, some are still in the process of being written and others are suggested but no active work has yet been done on them. It has not been considered advisable to have any of these monographs printed before the convention on account of the rush of other printing at this time, and because of the fact that there has not been sufficient time since activities were resumed to have them properly edited, but they should be printed as soon as possible.

1. Ice and Refrigeration, including domestic units (New Section). C. J. Carlsen.
2. Industrial Lighting (Revision of old Section). G. H. Stickney.
3. Isolated Plant Data (New). I. Lundgaard.
4. Electric Spot and Arc Welding (New).
5. Electric Furnace Data (New).
6. Steam Heating Data (Revision). E. L. Wilder.
7. Electric Vehicles and Industrial Electric Truck Data (Revision). F. M. Feiker.
8. Electric Heating and Drying (Revision).
9. Engineering Data on Incandescent Lamps (Revision). Technical Laboratory.
10. Preparatory Lessons in first part of Handbook leading up to Handbook Data for Power and Lighting separately (Revision).

On hand, but needing to be revised and brought up to date:

1. Article on Cement Manufacture.
2. Article on Cotton Goods Manufacture.

Manufacturers' Data

There has been considerable discussion on the question of including data from various manufacturers as a part of the Handbook. It is the opinion of the Committee that such data should not be considered as an actual part of the Handbook, but rather that such material should be printed the size, form, etc., to fit the Handbook, but not made an integral part of it nor included in the indexes of the various sections. By requiring that such data shall conform to the size, form, etc., of the Handbook, the Salesman upon receipt of the material can insert it in its proper place in the book or keep it separate just as desired, and refer to it only when needed.

New Books

The Committee desires to call attention to the fact that the stock of the present edition of the Handbook has been completely exhausted. This applies to both the data sheets which must be revised, and to the binders. If the Association continues its plan of giving these books to all new members of the Commercial Section, it is confronted with the task of reprinting the entire Handbook at a considerably advanced price on paper, printing, composition and binders. As a result of the war, the Class B membership has materially decreased. However, with the rehabilitation of the industry to its pre-war status, it follows that a good number of these members, or rather new members, will be obtained, in addition to the usual annual growth in membership.

The question, therefore, arises as to whether the Association can continue to send out these Handbooks at a present price of at least $4.50 per volume, as compared with $2.25 each in 1916. If the present price of materials is to remain, the Association must consider some method by which the cost of such books can be reduced. The Committee refers again to its 1917 report, quoted above, in which it suggests that each member of the Commercial Section be furnished with a binder and only that Section of the Handbook in which he is interested. The result of this plan would be that the cost of the book per member to the Association would be considerably reduced. At the same time, the question of furnishing a cheaper binder could be considered.

The Committee feels that the present loose-leaf form of book should be continued, in spite of the fact that the use of a bound volume, similar to the *Electrical Meterman's Handbook* and the *Handbook on Overhead Line Construction,* would materially reduce the cost. If the Handbook is continued for its present purpose, the loose-leaf is the only practical form to use.

Respectfully submitted,

R H Tillman, *Chairman*	S S Neu
E W Ackerman	W H Onken
C J Carlsen	T D Rose
J M Curtin	G H Stickney
R B Grove	E F Tweedy
I Lundgaard	E L Wilder

THE CHAIRMAN: I will be very glad to hear any expressions about the Handbook. If there is no discussion, we will return to the Handbook subject on Thursday in connection with the report of the Publications Committee.

(At 5:00 p.m. the meeting adjourned.)

SECOND COMMERCIAL SESSION
LIGHTING SALES BUREAU

Wednesday, May 21, 1919

R. H. BALLARD, Chairman.

C. L. LAW, Vice-Chairman

Chairman Ballard called the meeting to order at 2:15 p.m.

THE CHAIRMAN: We will come to order as the Second Commercial Session, Lighting Sales Bureau. I am scheduled to preside over this meeting, but having other engagements, with your permission, I am going to turn the meeting over to Mr. Law, the Chairman of the Lighting Sales Bureau, who will preside; and I will ask Mr. Thomas F. Kelly if he will come up and act as vice-chairman. (Applause.)

Gentlemen, I have the honor to present to you your Chairman, Mr. Law. (Applause.)

C. L. LAW: Gentlemen, the Chairman has no address to make in view of the fact that he has been in office only for two months, filling the unexpired term of Mr. Kelly. We are all glad to see Mr. Kelly back with us, although not in the same activities as he took with us before. We have quite a lengthy program, and I will proceed right to the first paper.

In the absence of Mr. Oliver R. Hogue, Chairman of the Committee on Commercial Aspects of Lamp Equipment, Mr. Ward Harrison will present the report of this Committee.

REPORT OF COMMITTEE ON COMMERCIAL ASPECTS OF LAMP EQUIPMENT

INTRODUCTION

Two years have passed since your Committee last made a report, and since the report was printed we have tried to investigate all the equipment that has been presented. A survey of the field indicates that excellent equipment can be had in wide variety. However, most of this material follows standard practice in design, and only to a limited extent have departures been made to provide better and simpler means of controlling and redirecting light. This condition can be credited largely to war conditions which limited manufacturers to the making of essentials. Now, however, we may look for developments along the lighting line that will be of interest and value to all.

The big problem of the salesman, as heretofore, is the furnishing of proper equipment for the mazda C lamps. While the public in general is beginning to realize the danger arising from unprotected lamps, a considerable amount of educational work remains to be done. With the line of equipment now available, there is no good reason why any installation should be laid out on any other lines than those which go to insure illumination which is adequate from every point of view.

The ability to lay out such an installation is based on an accurate and definite knowledge of the materials at hand and their possibilities. In this field, as in most others, the best information is gained from experience, and by comparison of installations. In many cases the apparent effect of lighting is deceiving, and the only real way to determine whether or not the illumination is what it should be is by actual test. This involves the use of a photometer of some sort and such an instrument has been out of the reach of the smaller central stations which really have very little use for it. Now, however, there is available an instrument known as the "Foot Candle Meter," which, while not extremely accurate, is commercially practicable. The illustrations, Fig. 1 and 2, will give an idea of this equipment, which proves of value in checking up existing installations

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Manuscript of this report was received March twenty-seventh.

Fig 1.—Foot Candle Meter

Fig. 2.—Foot Candle Meter Detail

and collating data for future design. The device, with everything necessary for its operation, is contained in a case 6½ by 8½ by 2 inches, and is so light in weight that it can be carried in the overcoat pocket. It is extremely simple to operate, the needle of a small voltmeter being set by a variable resistance at a mark on a scale, the instrument laid at the place where it is desired to know the illumination, and a calibrated scale read. By using this instrument and studying present installations, the salesman can accumulate a fund of information that will be of great value.

In the same connection, as a means of helping in the introduction of light, and more especially good lighting, comes electrically equipped furniture. The inconvenience caused by tangled extension cords often tends to prevent the use of otherwise highly desirable table lamps, candlesticks and the like. Therefore it is to the interest of the central station man to foster the movement to introduce electrically equipped furniture. Many houses and apartments were wired before the day of popularity of portable lamps and in such places the wired furniture often fills a long felt want. It is not the intention of this Committee to go into this subject at length, but merely to present the idea for consideration.

Floodlighting Units

Conditions during the year have created an enormous demand for floodlighting projectors to be used for protective lighting and for shipyard lighting. The need of larger units seemed imperative, and nearly all the manufacturers of floodlighting projectors have developed units to meet these demands.

The tendency has been to provide units having a wide spread of beam so as to illuminate a large area, rather than those with a long throw and a very narrow beam. In some cases the spread of the beam is secured by modifying the contour of the reflector from the true parabolic shape, while in other cases diffusing glass is used in front of a paraboloid, or Mangin mirror.

Most of these new large projectors are designed to use the regular 750 or 1000 watt mazda C multiple lamp.

One notable feature is the "spill shield" shown in Fig. 3, designed for fence lighting where it is desirable to have one

FIG. 3—FLOOD LIGHT WITH SPILL SHIELD

side of the fence in darkness while on the other side a considerable area is lighted. Such a condition allows a watchman to patrol in a shadow enabling him to see the fence and surrounding area with greater ease.

FIG. 4—FLOOD LIGHT UNITS WITH REFLECTORS

FIG. 4.—FLOOD LIGHT UNITS WITH REFLECTORS

Fig. 4 shows several flood light units now available, which are intended for use with lamps of from 250 to 1000 watts. Each size may be fitted with reflectors to give range of from narrow or focusing beam to one of very wide angle.

Other units are shown in Figs. 4-A, 4-B and 4-C and 4-D.

FIG. 4A—CAST IRON HOUSING HAMMERED REFLECTOR—200 WATT

FIG. 4 A.—CAST IRON HOUSING, 1,000 WATT

ETCHING OR FROSTING SOLUTION

As it is often necessary to use frosted lamps, and very frequently the size required is not carried in stock, the need for a convenient means of etching has been felt for a long while. Most of the solutions previously available were dangerous to handle and required special apparatus; now, however, there is on the market a mixture, known by the trade name of "Etcholite", which is especially adapted for frosting incandescent lamps, glassware, automobile headlights, signs, and all other etched work previously performed by acids or sand-blasting. It is harmless, will not burn or injure the body or skin in any way, and can be used and applied by anyone with absolute safety. It is only necessary to clean thoroughly the surface of

Fig. 4 A.—Sheet Iron Housing
Hammered Reflector, 300, 400 or
500 Watts

Fig. 4B.—

the article to be etched and dip it to the required depth, allowing it to be immersed for twenty seconds. The excess material is drained into the container for two minutes, and at the end of that time the article is washed in clean water and dried. A white satin finish is produced, very smooth in texture, and permanent. For extra heavy etching, a number of applications can be made. This solution has proven a boon to lamp users in many instances.

FIG. 4 C.—FLOOD LIGHT PROJECTOR, 500 WATT

FIG. 4D—

FIG. 4D—FLOOD LIGHT PROJECTOR

REFLECTOCAP

The development of the mazda C lamp with its concentrated filament was a decided help in the case of lighting requiring accurate control of the light. For general interior lighting this effect is of doubtful advantage, since diffusion is usually the aim. Frosting of the lamp helps out to some degree, the effect being about the same degree of diffusion as is obtained from the clear bulb vacuum lamp. In other places where still greater diffusion is desired, glass semi-enclosing units composed of reflecting top with opal diffusing bowl below, are suitable.

In contrast to the methods referred to above, is the principle of a new form of industrial lighting unit, illustrated in Fig. 5. A clear bulb lamp is provided with a closely fitting metal cap,

FIG. 5—REFLECTOCAP UNIT

silvered and polished inside. This cap covers the lower half of the bulb and thus intercepts the direct rays from the filament and redirects them so as to illuminate evenly the upper reflector which is twenty inches or more in diameter.

This arrangement keeps the filament out of the line of vision and makes the upper reflector the complete, secondary source of illumination. The large area of comparatively low brightness reduces eyestrain, softens shadows and prevents the difficulty arising from reflected glare from the work.

For high grade machine shops, plate glass works, inspection processes and similar activities, requiring high intensities and therefore larger lamps, these units permit the use of ample illumination without subjecting the eye to unnecessary discomfort and fatigue.

The R. L. M. Standard Reflector

As its name implies, this reflector, or more correctly this line of reflectors, is the result of close cooperation between the Reflector and the Lamp Manufacturers. Modern practice tends toward standardization of material and equipment, and with the improvement of the mazda C lamp to its present high efficiency came the need of some standard reflector. The result was the dome reflector shown in Fig. 6a and 6b. Other types giving various degrees of distribution are to follow shortly.

A B

Fig. 6.—R. L. M. Standard Dome Reflector
A.—Holder Socket Type B.—Shade Holder Type

The proposed system is to permit the manufacture of this line of reflectors by any concern which will live up to the conditions. Stock reflectors are to be subject to frequent tests, as to weight of steel, grade of enamel, distribution, and efficiency. These manufacturers will then be permitted to stamp their product with the name R. L. M. which will be equivalent to the Underwriters' approval on wiring material.

At present the reflector is used largely with the clear lamp, but for use over highly polished work, where reflected glare is a serious factor, a diffusing cap may be employed. This cap is of opal glass and fits closely over the lower half of the lamp bulb, thus eliminating the reflection from the filament.

With a complete line of these reflectors, the problem of selling will be decreased, since the customer may be assured of standard quality and design. Details of construction, support and socket design still offer basis of competitive sales, while improved methods of manufacture offer possibilities of greater profits.

INDUSTROLITE

The advent of the mazda C lamp into the factory has brought with it the necessity of lighting equipment which will for all practical purposes eliminate the glare which comes from the direct view of the filament. The illustration, Fig. 7, shows the

FIG. 7.—INDUSTROLITE

Industrolite, which accomplishes this result without expensive equipment, or a very great decrease of efficiency.

The unit consists of two porcelain enamel reflectors, the upper one flat and the lower one cone shaped and fitting close to the lamp. The result is a unit which has an efficiency practically the same as that of the deep bowl reflector with a decidedly greater angle of cutoff. The latter feature makes the Industrolite especially adapted for such places where low ceiling height almost prohibits the use of ordinary equipment.

NEW TYPE PRISMATIC WINDOW LIGHTING REFLECTOR

The construction of some windows makes it almost impossible to conceal entirely reflectors by a valance or otherwise.

In many corner or island windows, no matter where one stands, the bare filaments of the lamps are visible with most types of reflectors. This is obviously a bad condition. A prismatic reflector shown in Fig. 8 has been developed to overcome this

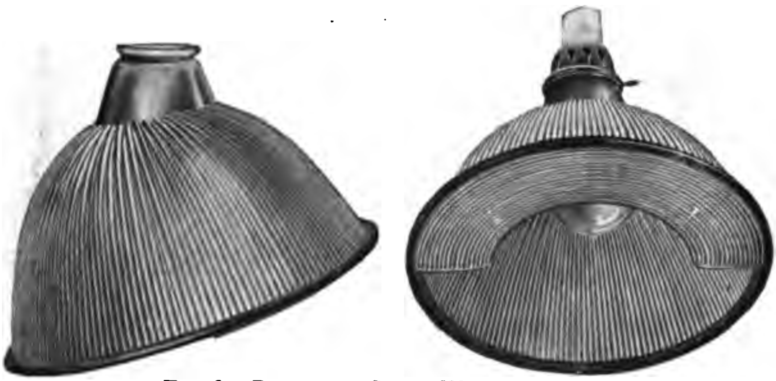


FIG. 8.—PRISMATIC SHOW WINDOW REFLECTOR

difficulty. A refracting plate is placed over the opening of the reflector, which shields the eye from the bare filament and deflects the light downward on the goods. The plate is held by a U-shaped steel band that engages a flange on one-half the reflector and the entire edge of the plate. The edge of the reflector is recessed so that the plate has a positive position. Sufficient room is provided for inserting the lamp without removing the plate. The reflector itself is of pressed crystal glass in an angle design.

REFLECTOR-REFRACTOR

In the last report, reflector-refractors for 75, 100 and 200 watt lamps were mentioned. Since then the line has been extended to provide for all sizes of lamps up to 500 watts. The large unit is made in two pieces which are held together by clamps. The efficiency and distribution obtained are such as to make the outfit very desirable for the lighting of stores, where it usually replaces a direct lighting fixture, in which the lamp filament is scarcely hidden from the eye.

The accompanying illustration, Fig. 9, shows the complete line for lamps from 75 watts to 500 watts.

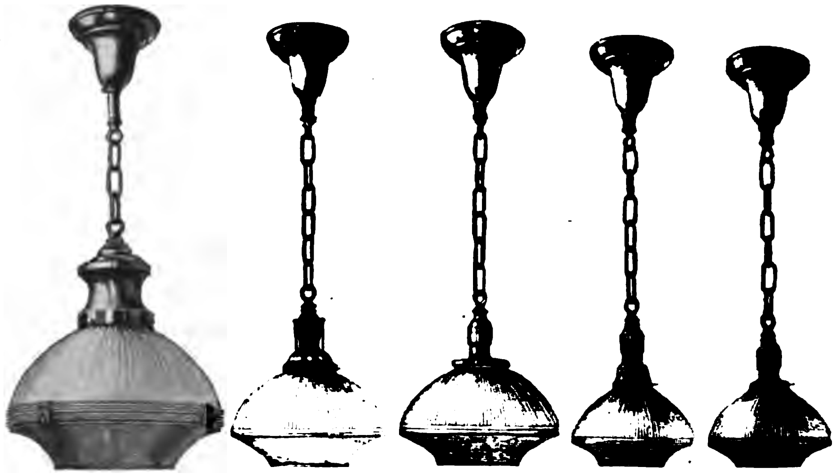


FIG. 9—REFLECTOR REFRACTOR UNITS

TINTED GLASSWARE

A type of illuminating glassware which has been on the market for some time, but was not mentioned by this Committee in the last report, has attained some popularity under the name Celestialite. This glass is made of several layers blown and fused together, one being opal glass to give diffusion and another blue glass to screen out some of the red and yellow rays from the lamp. Unlighted, both sides appear white, but lighted, the glass has a slightly blue tint.

The effect is to give a color nearer to daylight than ordinary mazda C lamps give. Many large department stores claim that the light obtained is valuable in that color values are more clearly brought out. Tests, however, show that the color correction is slight, and the glass is not to be compared with the color matching units mentioned in the last report.

Regardless of the actual showing under tests, it is a fact that the resulting illumination is above the average, if installed according to the recommendations of the manufacturer, and that several large stores are using the ware with satisfaction.

One point worthy of mention is the size of the units. The glassware is larger than that ordinarily used, and consequently to obtain the same amount of light, a lower bowl brightness will suffice.

The glassware may be obtained in several shapes and sizes two of which are shown in Fig. 10.

FIG. 10.—TINTED GLASS BOWLS

DIFFUSING COMMERCIAL UNITS

The increasing use of the mazda C lamp has been followed in the past two years by a great increase in the number of diffusing fixtures. These are of two general designs: (a) a hemispherical opalescent glass bowl, suspended below a flat or slightly concave opalescent glass plate of from one and one-half to two times the diameter of the bowl; (b) a similar dish or bowl with an opaque white shade above the lamp. These are known by many trade names, which we will not try to enumerate here. Their general characteristics are approximately the same.

These units are comparable with opalescent enclosing globes from the standpoint of brightness, diffusion, and efficiency. The light distribution, however, shows most of the flux to be in the lower hemisphere. In some cases, however, the upper plate is not sufficiently large to be of real value in directing the light downward.

FIG. 11—DIFFUSING FIXTURE OPAQUE REFLECTOR

FIG. 12.—DIFFUSING GLASS FIXTURE

Many of these devices are advertised as semi-indirect units, but an analysis of the manner in which the light is distributed shows them to be essentially of the direct lighting type. The illumination from an installation of such units does not have the characteristics of a good semi-indirect installation. In the latter case the major portion of the light is received from a large external source of low brightness—the ceiling—with the result

FIG. 13—DIFFUSING FIXTURE

that the distribution of light is quite even and the shadows soft.

On the other hand, fixtures of this character are very much better than many of the old forms of lamp auxiliaries. In most cases they entirely conceal the lamp and diffuse the emitted light. They have the great commercial value of being complete units easily installed.

An example of the type having an opaque reflector is shown in Fig. 11; of course it is only one out of many but it may be taken as typical.

Fig. 12 shows one of these having the opal glass reflector. This particular unit, as may be noted, has a clear top on the lower bowl, which makes the unit more nearly dust proof. A similar fixture of somewhat different design is shown by Fig. 13.

This field has been largely exploited and there are at present a great number of diffusing fixtures on the market, each claiming points of superiority. Many are good, while others should be avoided due to fundamental defects such as excessive brightness, poor glassware, poorly concealed lamps or faulty mechanical construction. Others, otherwise good, are so difficult to clean that they should not be recommended. Personal taste will enter largely into the question of design so that nothing can be said here as to appearance.

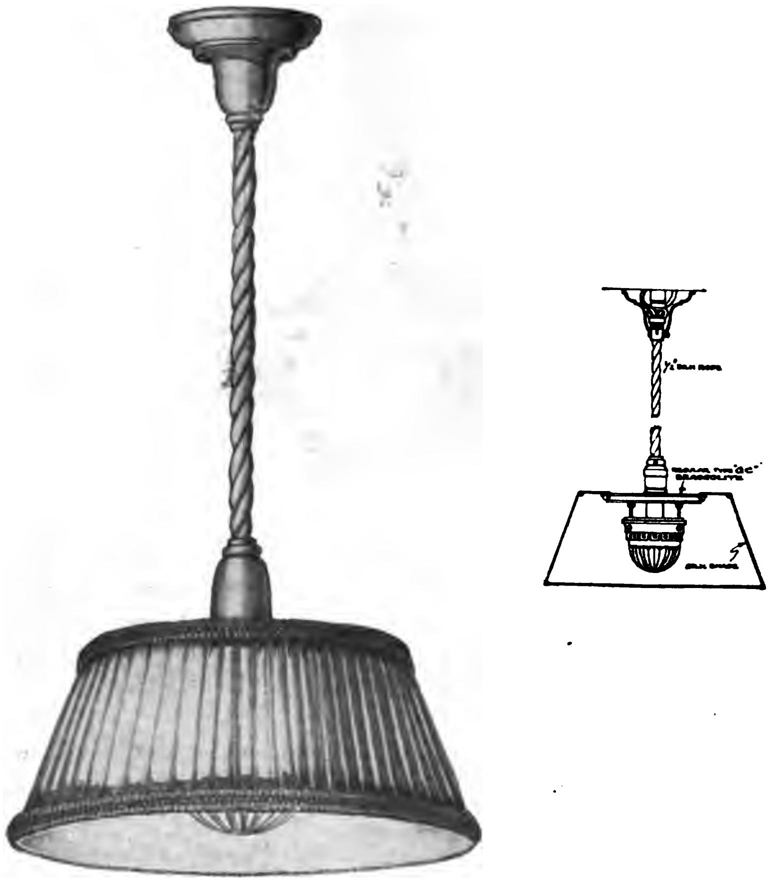


FIG. 14.—DECORATED DIFFUSING FIXTURE

Decorated Diffusing Fixture

The illustration Fig. 14 shows one of the commercial units just mentioned, but modified to make it more desirable for decorative lighting. The shade performs not only a decorative function, but also softly diffuses and tones the light.

This fixture is especially suitable for use in homes, high class shops, tea rooms, restaurants, or similar installations, where artistic appearance is essential and high efficiency desirable.

The shade is of double silk, the inside light and the outside colored to suit the decorations. A large variety of stock colors makes it possible to make a quick installation to harmonize with practically any scheme of decoration. The cord is a heavy silk covered twisted pair giving the effect of a silk rope.

The salesman who will keep this unit in mind should find many applications for it in the course of his regular work.

Duplexalite

The fixture shown in the accompanying illustration, Fig. 15, is one of the most interesting developments in equipment for the high efficiency lamps. The design is radically different from that of any of the older materials and offers considerable possibility.

The lower part is a flat disc of moulded translucent glass, the upper part is a reflector of porcelain enameled steel. The

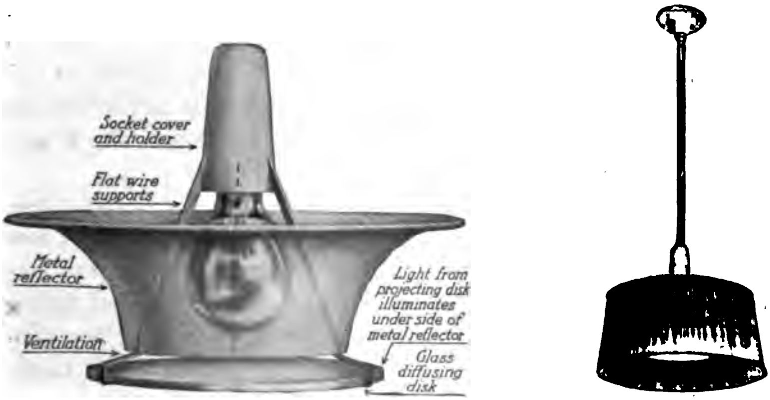


Fig. 15.—Duplexalite

result is indirect lighting for general use, with sufficient transmitted light to give some direct illumination without glare.

A space between the disc and the reflector permits enough light to be returned to light up the exterior, thus preventing the dark bowl, which is one disadvantage of indirect lighting equipment.

Tinting of the fixture in two tone effects adds to its decorative value for the home and other places where appearance is an essential factor.

One particular type is designed for use in residences with the 100 watt C lamp. The holder is so made that no other lamp will fit, thus obviating that one source of trouble, use of the wrong size lamp.

A very handsome decorative fixture is obtained by the addition of a silk shade. The light from the outer surface of the bowl lights the shade enough to give it a good appearance. At the same time there is no obstruction to the main sources of illumination, so that the efficiency is scarcely affected.

Hospital Lighting Fixtures

Since the issuance of the last report, a new line of seamless, dustproof fixtures, without exposed joints, screws, sockets, or key control, to catch dust and germs, has been designed. The wall canopies and other shell work are supported entirely from the inside, while the glassware is carried by a supporting shell with smooth surface and adjustable clamps. The glassware on these fixtures has been specially chosen to give good diffusion to the light and distribute it in a desirable manner. Fixtures of this character are available in pendant reflecting and diffusing types, ceiling and bracket fixtures, special bed lights and larger fixtures for the wards. (See Fig. 16 and Fig. 17.)

Indirect lighting is also highly satisfactory for hospital use. The ceiling, being the secondary source of illumination, is of low brightness and hence causes no discomfort. Dust covers are frequently used also. These consist of a clear glass disc fitting snugly over the fixture, allowing only enough air space for ventilation. The glass cover is readily cleaned with a damp cloth.

The finish of the fixture may be anything desired, white or ivory being customary. If equipment using more than a single lamp is used, varying intensities of illumination from the same fixture may be obtained by use of an electrolier pull switch.

Fig. 16.—Hospital Unit

Thus the range of intensities is limited only by the sizes of lamps available.

Fig. 17—Hospital Bracket

Piano Lamp

Similar in design to the lamp long used in theatre orchestras, the Play-O-Lite piano lamp is adapted to use in homes. It is so

Fig. 18.—Piano Lamp

constructed that the light rays are released only in a downward direction so as to fall on the music rack and keyboard. It is made of metal and can be furnished to harmonize with the wood of the piano. It is easily attached, and a felt cover over all exposed surfaces prevents scratching. (Fig. 18.)

Adjustable Arm Lighting Fixture

Although, generally speaking, local lighting is not to be recommended, there are cases where it is absolutely necessary, and in such cases a fixture which will hold the light in position is

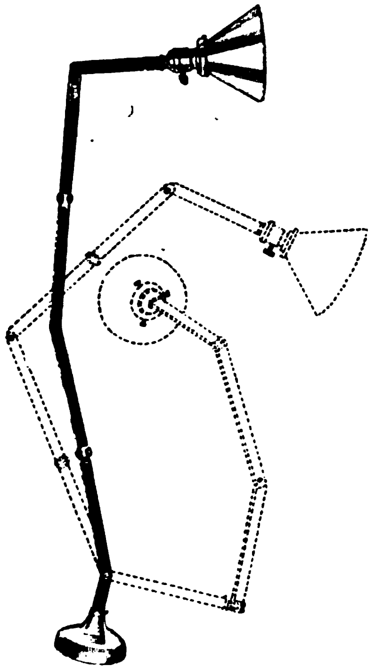


Fig. 19-A.—Adjustable Arm

preferable to a drop cord. In choosing the fixture care should be taken to see that the mechanical construction is such as will insure durability. Equipment of this kind must remain tight at the joints to be of any value. It must also be flexible enough to allow proper adjustment to conditions. Fig. 19a shows a unit in which alternate joints move at right angles, while lock spring washers insure an even tension. Wear is taken up by screw and stud adjustment.

FIG. 19-B.—ADJUSTABLE ARM

Fig. 19b shows another unit fully as good in mechanical design and one in which each joint is a universal joint allowing still greater freedom of movement. Either of the fixtures may be permanently attached to the machine and connected so as to avoid dangling cords or wires. Of course a suitable reflector should always be used to protect the eye and increase the efficiency of the lighting.

SMALL PORTABLE UNIT

A unit designed originally for a special order was so successful and so much in demand that it is now manufactured for

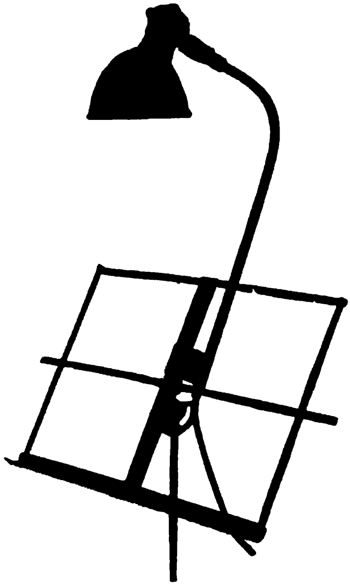


Fig. 20.—Music Rack Light

general sale. As shown in Fig. 20, it consists of an angle reflector showcase unit with special attachment for the music rack. The design of the reflector is such that the light is nearly all con-

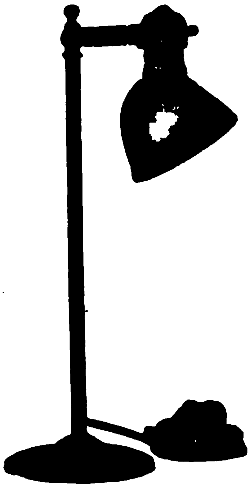


Fig. 21.—Desk Light

fined to the music, while a lever socket allows local control of the lamp.

Fig. 21 shows another application of the same reflector, which needs no explanation.

The two applications mentioned are only typical of the large number possible. The small angle reflector takes either the 25 or 15 watt round lamp, and can easily be attached to any machine or piece of furniture.

Desk Lamp

The principal objection to the use of desk lamps is the specular reflection from papers on the desk. This trouble is largely eliminated by the use of a diffuser under the lamp. The

Fig. 22.—Unolite

Unolite reading lamp, Fig. 22, applies this diffuser in such a way as to give a pleasing appearance combined with a softness of lighting. The lamp burns in the pendant position, which is desirable from a standpoint of life and efficiency.

Porch Light and House Number

For several years a number of concerns have been interested in the development of a combination porch light and house number which could be brought into general use. Such a device is desirable for the customer as it gives a distinct marking for his house and at the same time spreads light on the porch. From the central station side we see the use of an additional lamp, and while this is not a large factor individually, yet it should add quite an appreciable total to the lighting income.

Fig. 23.—Porch Light and House Number

The device shown in Fig. 23 is one of the neatest and most desirable now on the market. It presents an illuminated transparency with a number readable at some distance, while the back is frosted glass, allowing a soft spread of light over the steps. The general use of this equipment would add considerably to the comfort and convenience of all, as well as increasing the income of the central station.

Wicker Fixtures

Materials other than glass are beginning to receive the use in lighting which their good qualities warrant. It is, therefore, of interest to note that a number of new designs in wicker and reed-ware fixtures have become available during the past year. These are usually lined with plain or decorated silks or cretonnes, which give a touch of color to the illumination and are susceptible to an infinite variety of changes. Painted parchment and the like are also slightly in vogue, indicating a gradual realization of the possibilities and flexibility of incandescent lighting.

Vapor Proof Units

Vapor proof equipment is by no means a new idea, but the unit shown in the illustration, Fig. 24, is worthy of note as a new

Fig. 24.—Vapor Proof Unit

design. The lamp is enclosed in a heavy screw-threaded glass globe. The body is of one piece heavy cast brass and is threaded to receive the screw globe and protecting guard. A special gasket makes the fixture tight.

Fig. 25.—Vapor Proof Angle Unit

Fig. 25 shows a vapor proof unit combined with an angle reflector. The fixture consists of a one-piece, 30 degree angle, non-discoloring, white procelain enamel steel reflector, a heavy cast-iron hood and heavy clear glass globe screwed into a copper holder. It is designed as a safety lighting unit for chemical works, powder mills and paint factories, and, in fact, all industries subjected by exposed light to danger from explosive gases, vapors, and dust accumulation.

Stage Lighting

It is not very often that the central station salesman or engineer is called on to recommend equipment for stage lighting, but there are cases where small club rooms, lodge halls and so on do not wish to call in the companies specializing in that work. The small town theatre, too, is likely to hesitate before sending to the city for such advice. Therefore a mention of some of the equipment available seems desirable.

The hand-fed arc lamp has always been a nuisance in the theatre. It has necessitated the constant attendance of an operator, is clumsy, and increases the fire risk. With the advent of the high candle-power and rather concentrated filament mazda C lamps, experimental installations were made in a number of theatres. Their operation proved so satisfactory that at the present time they are almost universally used for a considerable portion of stage lighting formerly done entirely with arc lamps. When they were first tried out by progressive stage electricians, old arc lamp casings and similar make-shift housings were em-

Fig. 26.— Stage Box Light

ployed. Now, however, we are pleased to report that standard equipment is listed, especially designed to accommodate mazda C lamps and to give the different distributions required for stage lighting.

The illustration, Fig. 26, shows an open box light, for use principally in the wings to throw a uniform flood of illumination on the scene of the play, also to produce colored illumination by the use of colored gelatine mediums.

Fig. 27.—Mirror Box Light

Fig. 28.—Spot Light

The type shown is designed for use with a 1,000 watt mazda C lamp and a similar unit may be had for use with ten 100 watt lamps if desired. The head is adjustable to any angle, permitting the light to be thrown in any direction. It is superior to the arc type because it is noiseless, the light is steady and operating expenses are reduced by the elimination of individual operators. The equipment itself is lighter since no rheostat is required and several units may be controlled from a central point.

Fig. 27 shows a unit designed for the same purpose, but having a mirror reflector which gives increased efficiency and greater permanence.

The lens nitrogen spot light shown in Fig. 28 has decided advantages over the arc spot light, especially for short range work as in halls, cabarets, etc. This unit may be equipped with dimmer and color screens.

A suspended type spot light is the latest development along

FIG. 29—SUSPENDED SPOT LIGHT

this line. Fig. 29 shows one of these units suitable for a 500 concentrated filament lamp. It is provided with a ring suspension for overhead use, as between the borders, and produces very bright lighting from above.

Incandescent lamps have for some time been in use for border lights, proscenium strips and footlights, but most of the

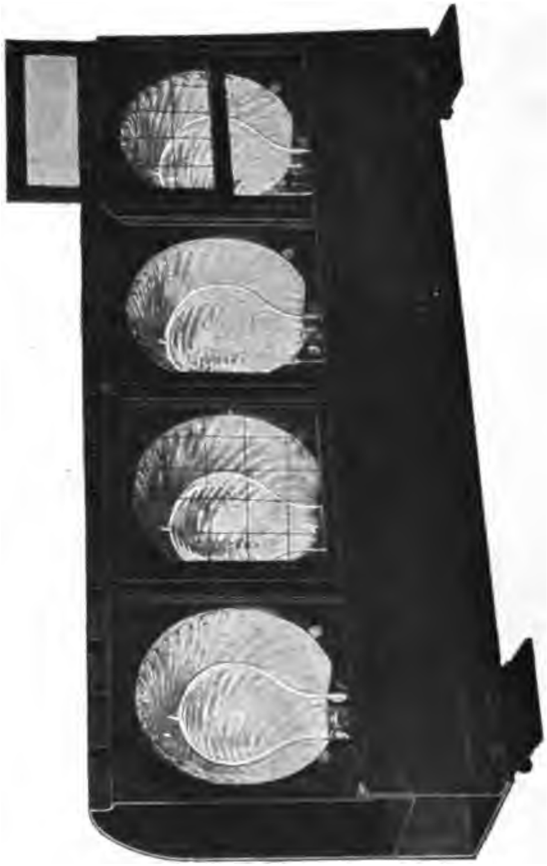


Fig. 30.—Proscenium Lights

equipment is designed for mazda B lamps. Fig. 30 shows equipment for proscenium or footlights, while Fig. 31 shows border light equipment.

Porcelain Lock Socket

There has long been a demand for a good lock socket which could be used where exposed to acid fumes, moisture, etc. A lamp installed out of doors, in a cellar or similar place, is most likely to be stolen, hence the need of a lock socket. A new socket developed by the General Electric Company is designed to enclose the standard G. E. locking socket interior in a porcelain shell (see Fig. 32).

FIG. 31.—BORDER LIGHTS

Fig. 32.—Porcelain Lock Socket

One point of particular merit is that when locked the socket permits the lamp to swivel freely, preventing injury to either lamp or socket, if an attempt is made to remove the lamp without the key.

Door Switch

Central stations and others have for some time been advocating the use of lights in closets, pantries and such places which have heretofore been left in darkness. The householder's principal objection is that these lights are too often left burning for long periods. A switch has been designed to operate with the

Fig. 33.—Door Switch

opening and closing of the door so that the light burns only when the door is open. A key socket or second switch wired in series with the door switch should be installed to permit turning off the light when the closet is left open for airing or cleaning. Fig. 33 shows one style of this switch.

There are numerous other applications for such a switch, in which it can be of value to the customer and hence to the central station. One that might be mentioned is to the door of film developing rooms. Here the switch is so connected that should the door be inadvertently opened the lights in the outer room are immediately extinguished, thus preventing loss by spoiling the film. A switch designed for this service is shown in Fig. 34.

Fig. 34.—Door Switch

In this case the lamp is lighted with the door shut and off when the door is open. The mechanism is positive and quick in action; less than 0.25-inch movement in the door actuates the switch and makes or breaks the circuit.

Lever Switch

A new departure in the line of switches is one operating on the lever principle. It has been applied very successfully where a pull switch was formerly used, and although the mechanism is quite different, the action is similar.

The accompanying illustration, Fig. 35, shows the application to a lamp socket. In this case the projecting stud acts as a lever if the pull is in any other direction than a right angle. The result is reduced strain on the shell and easy operation. A smooth, easy pull on the chain, and the switch acts.

Fig. 35—Lever Socket

It should also be noted that this socket is approved for 600 watts at 220 volts, which should be of interest to those who have been seeking a heavy-duty key socket.

Street Lighting Units

Since our last report, one or two strides have been made in connection with street lighting equipment. One which affects the appearance of the unit, and to some extent the distribution, is

Fig. 36.—Street Post Units, Dome Refractor

the white glass cap to replace the metal cap. This makes the whole top luminous at night and has the effect of throwing more light into the upper hemisphere, thus lighting up the adjacent buildings. Such a condition is quite desirable for commercial installations.

Then for the lighting of residential streets, where the posts would average 100 feet apart, an addition in the form of a dome refractor has been made. Fig. 36 shows this refractor in place in a Novalux head. The action is to intercept the light now going to the upper hemisphere and redirect it to the lower hemisphere, where it will be effective. In connection with this refractor, it was found that an opal globe diffused the light too much and poor distribution resulted. To give the desired control a stippled glass globe was devised. The inner surface of

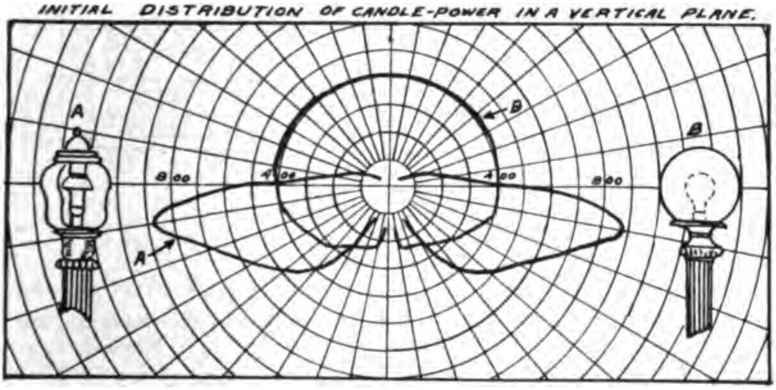
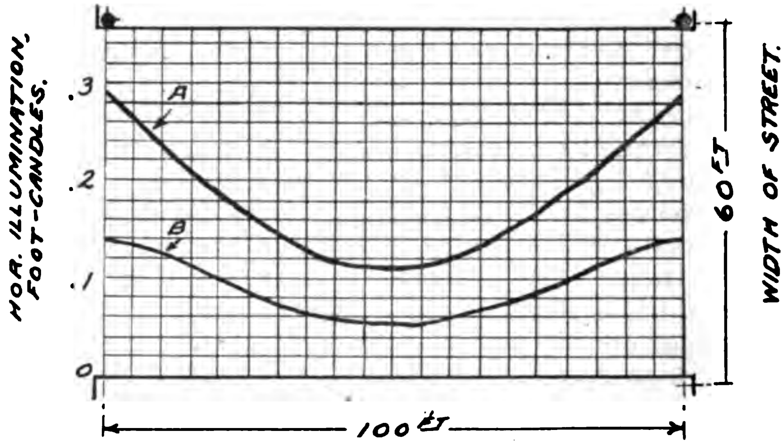


FIG. 37.—LAMP OPERATED AT 6,000 LUMENS

the glass is marked with numerous small irregular prisms, which in combined action diffuse rather than refract. The result is good distribution and the effect of the stippling is to give a sparkle to the light, making it "alive." Sunlight striking the globe during the day has the same effect, making the unit very attractive.

At the present time where ornamental street lighting is used for residence streets, we find an opal or etched diffusing globe.

The distribution from such a unit is nearly uniform, with the majority of the flux in the upper hemisphere, where it is lost. Fig. 37 gives a good comparison between a unit with the refractor and one with diffusing globe. The actual difference in illumination of the street is shown by the curves in Fig. 38.



SYSTEM	WATTS PER LINEAR FT.	AVE. F.C.	MAX. F.C.	MIN. F.C.	RATIO $\frac{MIN}{MAX}$
A	3.3	.180	.290	.120	.410
B	3.3	.090	.140	.053	.380

HEIGHT OF UNITS 15 FEET.

Fig. 38.—Illumination on Street

The foregoing discussion refers principally to the street post, but in Fig. 39 the same refractor has been applied to the pendant unit.

Fig. 39.—Street Light, Dome Refractor

Fig. 40 shows three curves; A being that of the refractor unit, B that of the same unit with an opal instead of the prismatic globe, while C shows the distribution from the unit with the dome refractor and stippled glass globe.

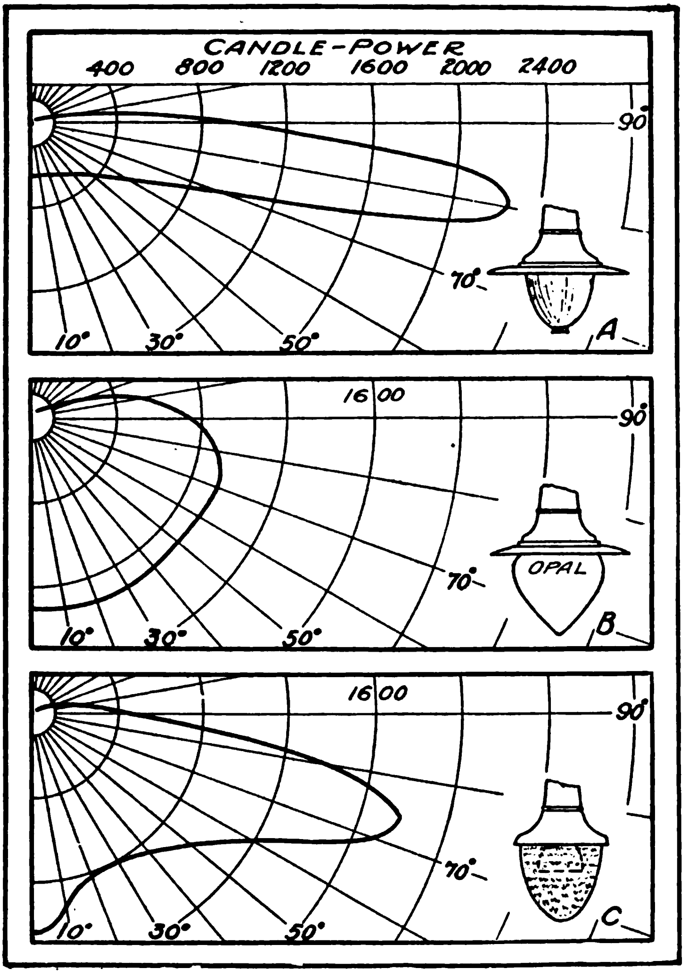


FIG. 40.—DISTRIBUTION CURVE

DISCONNECTING HANGER

In the last report some attention was given to the importance of proper cleaning of lighting equipment, and some devices used in this work were shown. In a great many cases the lighting equipment must be hung high to be out of the way or to give wide distribution. In such cases cleaning is usually neglected because of the difficulty and even danger involved. This brings to our attention a device which, while not absolutely new, is still worthy of mention, that is, the disconnecting hanger. Fig. 41

Fig. 41—Disconnecting Hanger With Application

shows one of these hangers with suggested application, while Fig. 42 gives a phantom view showing the construction.

Many industrial plants, such as foundries, boiler shops and so on, must have lights hung high to clear the traveling cranes, and at the same time the dust in the air in such places soon renders the reflectors practically worthless. A cheap and easy means of cleaning makes for a much more satisfactory lighting system and promotes the use of artificial light.

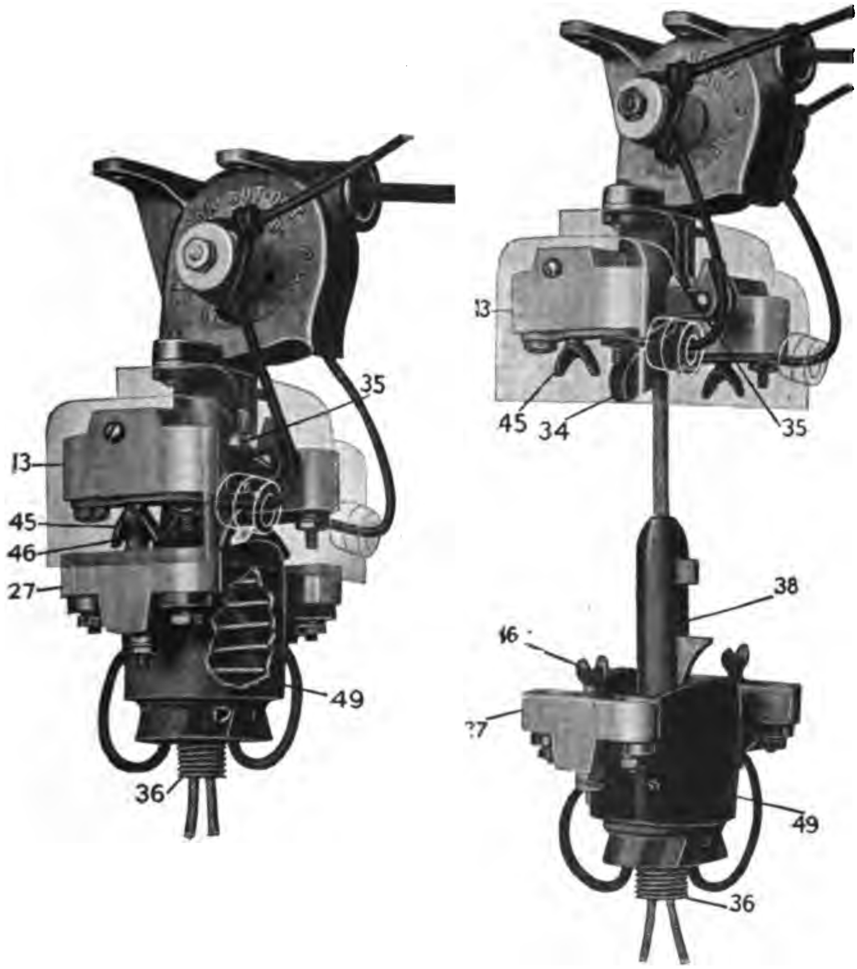


Fig. 42—Disconnecting Hanger Details

Moving Picture Equipment

It has always been felt that arc lamps were the only practical means of projecting motion pictures, but recently a high current, relatively low voltage, concentrated filament mazda C lamp has been developed for this purpose. However, the use of this lamp makes certain changes in the other equipment necessary, and to accomplish the best results a complete lamp housing has been designed.

To utilize the maximum amount of emitted light, it is necessary to employ a spherical mirror and special condensers. The use of the mirror is entirely new and will naturally confuse the operator for a time, as it must be focused as well as the filament itself. The method used is, first adjust the lamp with reference to the lenses so as to get the proper focus, then adjust the mirror so that the reflected image comes into the proper place between the coils of the filament. This adjusting, however, is done from the outside and with the door closed so the operator is not blinded. Then, too, once adjusted, there need be no change until a new lamp is installed. Changing lamps quickly is essential, so a removable holder containing an extra lamp is supplied. Thus all that is needed is to change holders. The lamps are so nearly alike that the picture may be started with a fair light and then attention given to proper adjustment.

Special plano-convex condensers are used, giving a better result because they have a greater focal length than the ordinary prismatic condensers.

It is also necessary to have some means of reducing the line voltage without undue losses, and for this purpose compensators are employed on alternating current circuits. This auxiliary device is made in a number of forms, available for different conditions.

Fig. 43 shows this new housing with spare lamp holder and lamp, while Fig. 44 shows the complete machine. This outfit is highly successful and has been found well suited for all except the very largest theatres.

There is also a small portable outfit, which has been used very successfully in connection with industrial, educational and commercial exhibitions.

This equipment is made in several styles for use on circuits of 35 volts or 110 volts. It is put up in a case 17 by 17 by 7 inches, which may be carried with no greater effort than a suit case. Since the total consumption does not exceed 500 watts, the device may be attached to any lamp socket.

All adjustments are made from outside the case and the film is run by a motor, so that once started no more attention is needed. This feature makes the equipment ideal for sales talks, since the salesman can devote his entire attention to the talk.

Fig. 43.—Motion Picture Projector Lamp Housing

The smaller size, which is ordinarily used for this purpose, will project a picture 8 feet in diameter at a distance of 35 feet.

It has the advantage, too, that it can be stopped on the film, giving a still picture, thus permitting discussion of particular details.

Fig. 44.—Motion Picture Projector

Fig. 45 shows the interior arrangement of one of these machines, and gives a good idea of its compactness and simplicity.

As to uses for the outfit, the possibilities are too numerous to be enumerated here, but it may be said that this machine may be used for any motion picture projection not exceeding 80 feet.

FIG. 45.—PORTABLE MOTION PICTURE PROJECTOR

FACTRYLITE

Where the outlets for electric lighting must, of necessity, be far apart, the only means of obtaining a uniform distribution at a working intensity is to use large lamps hung high. The ac-

FIG. 46.—No. 800 FACTRYLITE

companying illustration, Fig. 46, shows a unit designed for the 300-watt lamp and recommended for use where spacing does not exceed 16 feet and where hanging height can be from 10 to 16 feet above the floor. The aim in general is to make the height above the working plane one-half the spacing. The reason for

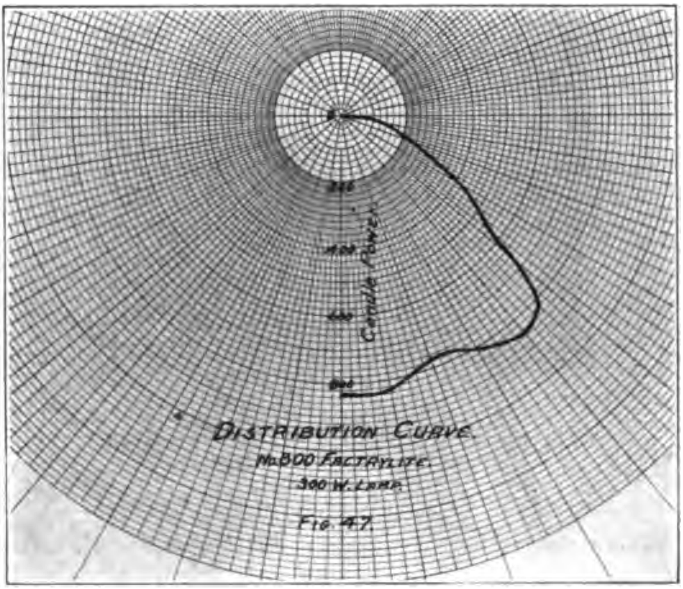


FIG. 47.—CURVE

FIG. 48—No. 800 SPECIAL FACTRYLITE

this is shown by the distribution curve, Fig. 47. This shows a maximum intensity at an angle of 45 degrees, with gradual decrease both up and down.

This unit consists of a large reflector, 23 inches in diameter, nearly flat, with a shallow skirt around the edge. To protect the eye from the direct rays from the filament, a band of opal glass is suspended around the lamp.

A similar unit designed for the 500-watt mazda C lamp is shown in Fig. 48. The opal band is larger, and vanes are added below the lamp to give better protection to the eye. Its application is, in general, the same as the 300 watt size, the difference being the higher hanging and wider spacing allowable for equal illumination.

Both units have unusually high efficiency and have given satisfaction wherever properly installed. The construction is of especially heavy steel and the whole design looks toward durability and service.

Respectfully Submitted,

O R Hogue, *Chairman*	Ward Harrison
K E Adams	O L Johnson
J H Allen	P O Kennedy
F D Beardslee	C L Law
S B Burrows	A H Loring
M T Blackwell	H C Meredith
E L Callahan	A A Pope
R C Close	A L Powell
Burleigh Currier	G B Regar
J F Derge	J L Stair
F H Golding	W A Wolls

APPENDIX

FIG. No.	NAME	MANUFACTURER
1	Foot Candle Meter	National Lamp Works, G. E. Co.
2	Foot Candle Meter	Nela Park, Cleveland, Ohio.
3	Flood Light with Spill Shield	National X-Ray Refl. Co., Chicago.
4	Flood Lights and Reflectors	National X-Ray Refl. Co., Chicago.
4A	Flood Light Units	Western Elec. Co.
4B	Flood Light Units	G. E. Co.
4C	Flood Light Units	Pittsburgh Refl. Co., Chicago.
4D	Flood Light Unit	Crouse Hinds Co., Syracuse, N. Y.
5	Reflectocap Unit	Ivanhoe Regent Wks., Cleveland, O.
6A	R. L. M. Standard Reflector	Benjamin Elec. Mfg. Co., Chicago.
6B	R. L. M. Standard Reflector	Ivanhoe Regent Wks., Cleveland, O.
7	Industrolite Unit	Luminous Unit Co., St. Louis, Mo.
8	Prismatic Window Reflector	Holophane Wks. of G. E. Co.
9	Prismatic Reflector-Refractor	Holophane Wks. of G. E. Co.
10	Celestialite Glass	Gleason-Tiebout Co., New York.
11	Brascolite	Luminous Unit Co., St. Louis, Mo.
12	Denzar	Beardslee Chandelier Co., Chicago.
13	Diffusing Unit	Ivanhoe Regent Co.
14	Decorated Brascolite	Luminous Unit Co., St. Louis, Mo.
15	Duplexalite	Duplex Lighting Wks., G. E. Co.
16	Hospital Fixtures	Pettingill Andrews Co., Boston, Mass.
17	Hospital Fixtures	Pettingill Andrews Co., Boston, Mass.
18	Play-O-Lite, Piano Lamp	Play-O-Lite Co., Buffalo, N. Y.
19	Adjustable Arm	K. F. M. Lindblad, Boston.
20	Music Rack Unit	Nat. X-Ray Reflector Co., Chicago.
21	Desk Light	Nat. X-Ray Reflector Co., Chicago.
22	Unolite	Unolite Co. of America, Indianapolis, Ind.
23	House Number	Crouse Hinds Co., Syracuse, N. Y.
24	Vapor Proof Unit	Benj. Elec. Mfg. Co., Chicago.
25	Vapor Proof Unit, Angle	Benj. Elec. Mfg. Co., Chicago.
26	Stage Box Light	Univ. Elec. Stage Lighting Co., N. Y
27	Stage Box Light, Mirror	Univ. Elec. Stage Lighting Co., N. Y.
28	Spot Light	Univ. Elec. Stage Lighting Co., N. Y.
29	Suspended Spot Light	Univ. Elec. Stage Lighting Co., N. Y.
30	Proscenium Lights	Nat. X-Ray Refl. Co., Chicago.
31	Border Lights	Nat. X-Ray Refl. Co., Chicago.
32	Porcelain Lock Socket	G. E. Co., Schenectady, N. Y.
33	Door Switch	Cutler Hammer Co., Milwaukee.
34	Door Switch	Benj. Elec. Mfg. Co., Chicago.
35	Levolier Socket	Despard Gordon Co., Chicago.
36	Dome Refractor, Street Post	G. E. Co., Schenectady.
37	Curve	
38	Curve	
39	Street Lighting Unit	G. E. Co., Schenectady.
40	Curve	
41	Disconnecting Hanger	Thompson Elec. Co., Cleveland, O.
42	Disconnecting Hanger	Thompson Elec. Co., Cleveland, O.
43	Motion Picture Lamp Housing	Precision Machine Co., New York.
44	Motion Picture Lamp Projector	Precision Machine Co., New York.
45	Portable Projector	The DeVry Corp., Chicago.
46	Factrylite No. 800	Henkle-Best Co., Chicago.
47	Curve	Henkle-Best Co., Chicago.
48	Factrylite No. 800 Special	Henkle-Best Co., Chicago.

THE CHAIRMAN (Mr. Law): We tried to organize the discussion by sending out some copies of these papers to a selected list of gentlemen, and I will call on those men first. Is Mr. Stickney here?

G. H. STICKNEY, Harrison, N. J.: While we have made much progress in the application of incandescent lamps, it seems to me that we often overlook the great possibilities for new and more intensive application which are awaiting our attention. For example, just before coming here Mr. Ryan and I were in conference with some representatives of the Aeronautical Society who pointed out numerous applications in connection with their work, such as the lighting of landing fields all over the country, advertising lighting, signal lighting, etc., etc.

By studying requirements and developing accessories, we can make large increases in the use of lamps and electricity.

In developing or selecting equipment it should be borne in mind that the incandescent lamp being a renewable part, should be standardized in as small a number of styles as possible, and these should be simple and adaptable. The fixture, on the other hand, being more permanent can be made to introduce the appearance, distribution and diffusive characteristics required by each class of installation. It is now possible to meet almost any present lighting requirement with standard lamps, merely by making a proper selection of available equipment. Those responsible for lighting installations are not giving this question the attention it deserves. It is quite a common occurrence, in modernizing a lighting installation, to double the efficiency. And there are many installations which need such revamping.

Large sums are spent to increase the efficiency of electric generators by one or two per cent, when relatively small expenditures would make much larger gains in the efficiencies of utilizing the current. The lower the cost of light the more the public can afford to spend for lighting. Economics of light production has been a dominant factor in the growth of the lighting business.

This report furnishes valuable information regarding the selection of lighting equipment which should be applied by every lighting representative in advancing lighting service.

Among the most important equipment described is the R.L.M. reflector. These reflectors, which embody the experience of the reflector manufacturers and the illuminating engineers of the lamp manufacturers, will be standardized by the leading reflector manufacturers for general lighting in industrial plants. Beyond the merits of these reflectors as lighting equipment, they will have an important influence on lighting practice through the fact of their standardization. They not only lessen the possibility of making poor installations, but offer an opportunity of presenting more definite and simple rules on suggestions for proper lighting.

In view of the importance of good industrial lighting in increasing production and preventing accidents, there is more need for raising the standard in this field than in almost any other. And in this direction we have the support of the State industrial commissions and their codes.

While it is not practicable to write definite rules regarding decorative fixtures, the list in the report will be helpful toward their proper selection.

THE CHAIRMAN: Is Mr. O. L. Johnson, of Chicago, here?

R. FREMONGER: Mr. Chairman, Mr. Johnson has been detained but has sent a written discussion. With your permission I will read it.

"Appreciation of the value of good illumination is on the increase, as evidenced by lighting codes in force and proposed, compiled by the industrial commissions of several States, and also by the attitude of large manufacturers. The war has shown clearly that the working man is a necessary factor in quantity production and that daylight conditions or better artificial lighting must be provided in order that production be kept at or greater than its daylight level.

"With the report of this Committee issued in 1917, in his possession, as well as the additional material presented in this report, the salesman is prepared to recommend lighting equipment which will fulfill the requirements of scientific illumination. The descriptions are adequate, views of the devices accompany each and the name of the manufacturer is given so that additional information can be obtained upon request.

"Some purchasers of lighting equipment think that size and shape of reflector, gauge of steel, quality and color of enamel, make little difference in the lasting qualities of the reflector or the resultant intensity of illumination. That this belief is unfounded is shown clearly by the coordinated efforts of engineers of the reflector and lamp companies resulting in the R.L.M. standardization. This is an effective effort to make it harder to buy a poor reflector. The Dome Type, as now standardized, meets the lighting codes of all states; it eliminates objectional direct glare, softens shadows, and when used with a bowl frosted lamp or opal lamp cap, reduces to a minimum the glare from polished material which is in the line of vision. Gauge of steel, grade of enamel, efficiency and distribution will be checked frequently by an impartial laboratory, thus insuring to purchasers of this equipment, the best porcelain enameled reflector for use with mazda C lamps.

"The development of a gas and vapor proof angle reflector fills a long felt want for the illumination of powder mills, ammunition and chemical plants, besides paint factories and other plants whose conditions of manufacture necessitate the use of this type of lighting equipment. The angle unit supplements the already well-known flat cone and shallow bowl gas and vapor proof fixtures.

"As stated, 'Local Lighting is not to be recommended, generally speaking.' There are many reasons for this, such as short circuits, unsightly appearance of drop cords, lamp breakage, and glare with its attendant results such as headaches, indisposition to work, ruined material, wasted time and frequent accidents.

"Reflectors are designed for a certain lamp which places the filament in an exact location with respect to the reflecting surface. When a reflector is used with a lamp for which it was not designed, the distribution is distorted and the intensity of illumination likewise varies so as to cause non-uniformity. Under these conditions, economy of operation is not possible.

"This report puts in the hands of those who recommend lighting equipment, some accurate information as to what is on the market to meet all conditions, and I hope that good use will be made of the material here presented, for I am sure that such use will aid in the general propaganda and impress upon industrial executives the value of scientific illumination."

THE CHAIRMAN: The paper is now open for general discussion. We have five minutes left. If there is no further discussion on this paper, we will proceed to the next, the Report of the Committee on Residence Lighting, Mr. C. W. Johnson, of the Consumers Power Company, Jackson, Mich., Chairman.

REPORT OF COMMITTEE ON RESIDENCE LIGHTING

Due to conditions that have existed during the greater part of the time since the 1916 convention in Chicago, progress in residence lighting work has been exceedingly limited. Public utility companies have been forced to make retrenchments, not only in operating expenses, but also in the use of money for line extensions and other purposes that under normal conditions would be considered essential.

The average gross revenue from residence lighting consumers has continued on about an average basis during these last two years. Lighting restrictions governing commercial and street illumination, as enforced by the Fuel Administration, have effected residence business but little. The lack of building activity has shown its effect on the residence business in practically eliminating any increase in the number of consumers served. This is illustrated very forcibly by the following figures reported by a company operating in a group of towns, the largest of which has a population of 100,000:

		Number of Residence Consumers	Gain During 12 Months
December,	1914	36,041	
"	1915	42,816	6,775 = 18.8%
"	1916	52,807	9,991 = 23.4%
"	1917	61,959	9,152 = 17.3%
"	1918	66,407	4,448 = 7.2%

The effects of building restrictions came in evidence during the last half of the year 1917. In the communities served by this company very few houses were built during 1918, and, as no extensions were made, the new consumers added were few.

Though the coming year holds forth encouragement in respect to building activity, the results as yet are not in evidence. The number of building permits shows a substantial increase, but as there is a time lag of from six to nine months before the effect is shown on the central station records, we cannot hope to reach a normal rate of increase until July or August of this year.

Manuscript of this report was received March 31st.

One month after the armistice was signed the following questionnaire was sent to central station men in various sections of the country. The replies received are given in general terms after each question:

(A) Do you expect industrial activity in your section to show material increase during 1919, and if so, will this result in a greater demand for new houses?

Answer.—The general impression seemed to prevail that we were to look for continued activity in industrial work. The housing conditions in many communities are so acute that immediate action is necessary. With labor and material becoming more plentiful, the building of homes should follow.

(B) What plans do you propose to carry through during 1919 for the purpose of increasing your revenue from residence business?

Answer.—The active selling of electric merchandise was considered the best means of increasing the revenue. Only 50 per cent of those replying sold merchandise. The other companies depend upon electrical dealers and contractors to push appliance sales.

(C) Does your company require customers to finance extensions, and if so on what basis?

Answer.—Approximately 65 per cent of the central stations required customers to finance extensions during the past year. In most cases the amount was refunded. Some of the companies required customers to purchase preferred stock in sufficient amount to meet the necessary expenditure. Though money conditions are somewhat better, the necessity of securing help to meet the investment still prevails with most operating companies. The present indications are that customers will be called upon to do this financing during the entire year.

(As the subject of financing extensions is of interest to member companies, a few forms and rules in force are shown at the conclusion of this report—pages 158-163.)

(D) Do you expect to solicit aggressively business of existing houses along your lines, and if so, under what plan?

Answer.—Extensive house-wiring campaigns are to be conducted by about 65 per cent of the central station companies from which replies were received. The other companies are considering only such business as will come unsolicited. The station and line capacity in some cases will not permit any additional load until new equipment is installed.

(E) By what plans do you expect to increase the revenue you now derive from present residence consumers?

Answer.—The more extensive use of electrical heating appliances and the elimination of empty lamp sockets were considered the most effective methods of increasing the residence business.

(F) Does your company aggressively sell electrical appliances?

Answer.—As stated before, only 50 per cent of the central station companies replying sell merchandise.

(G) Do you require residence consumers to pay for the service drop or connection?

Answer.—A few utility companies make such a charge. In some states the utility commission will not permit such charges, holding same to be investment costs on which the rate for service is to be based. In a few cities, franchises under which companies operate demand that the service connection must be provided by the company.

A few years ago service connections for gas consumers were furnished by the company, but that practice has now been practically abandoned. Service connection to water and gas mains is carried by the consumer and electric companies may also find it desirable to adopt such a plan.

The foregoing will serve to show by what means the central station men expect to promote the earnings from residence business.

The value of electric service for the home is now well recognized. With few exceptions, all new houses are wired for service.

There are a great many houses along existing lines that do not use central station service, and it is imperative that active work be undertaken to secure that class of business. As a large number of old houses are occupied by tenants who do not own the property, it has been found difficult to allow credit extension on contracts. This has been overcome by one member company through joint signature by the owner and tenant on the wiring contract. In this way the central station is assured of final payment on contract.

The subject of house-wiring campaigns was covered in a very complete manner in the 1916 report. Plans used and advertising matter for both newspaper publicity and folders were shown. There is very little that can be added at this time to that subject, excepting the outline of a plan used by one member company.

During 1916 and 1917 house-wiring campaign work had begun to make excellent headway. A few of the central stations maintained their own wiring departments and were thereby able to take care of the work obtained by their sales organizations, while others were compelled to depend upon electrical contractors. Those companies doing their own wiring work were in a position to obtain sufficient profit in the operation of that particular department to pay for the cost of securing the business. No such opportunity was available, however, to central stations sub-letting the work to contractors. It was found that the average cost of securing old-house wiring contracts, together with the expense for the investment necessary to carry the account, was approximately $5.00 per contract. Under the stress of financial conditions, it was deemed advisable in one company to make this soliciting cost a part of the contract price. This is accomplished by adding 7½ per cent to the contractor's price, plus $2.00 which is paid as a commission to regular salesmen. This then works out as follows: Assume the contractor's price on a job is $100.00; to this amount is added 7½ per cent., or $7.50, to offset the carrying charge and collection expense, and $2.00, which is to be paid the solicitor. The full contract price is then $109.50. If the customer elects to pay in cash on completion of the work, then a 5 per cent discount is allowed. If the deferred payment plan is desired, he agrees to pay the contractor 25 per cent or more within ten days after completion of the work and the balance in twelve equal monthly payments to the company. This plan has now been in effect some little time and is working out equally as well as the plan previously used when the company carried the entire expense of securing the business. By this method it is expected that the company in question will save approximately $20,000 during 1919.

It may be of further interest to know how the work is handled, and a copy of the contract and a salesman's working page, are shown on pages 155-157. The salesman out on the job carries a pad of working pages with him, and the necessary information as to required outlets is filled in and the job figured up, the data then being referred to the credit and line departments for approval. This precaution has been taken, as it was found that salesmen would secure contracts for houses that were not along the company's existing lines. Now the line department must give its approval on each job. The contract is then written up in triplicate, by the clerk and the salesman who goes out to complete the sale. Up to this time he has made no definite statements to the customer as to the price of the job. The work is then turned over to a contractor who agrees to collect 25 per cent or more, which amount he retains. When the job is completed, the contractor invoices the power company for the remaining portion due. The schedule used is extremely simple and this, too, may be of interest:

Light outlet	$2.75	
Switch outlet with S.P.P.B. installed	3.50	
Switch outlet, 3-way push button installed (Pair $9.50)	4.75	each
Edison base board receptacle installed	3.50	
Add to the above for 2-wire to our entrance	12.00	
Add to the above for 3-wire to our entrance	14.00	

For hardwood or double floor add, per outlet...... .50

For flats of two or more apartments, add for each box 2.75

One Edison receptacle will be installed in any wired home for.................................. 7.00

The purpose of the above schedule has been to eliminate just as many details as possible and to simplify the work to be done by the solicitor.

Without question, one way in which the central station can increase its revenue from residence business will be through the wiring of old houses along its existing lines. This means a very thorough saturation of the district served, thereby reducing the unit cost of investment.

What is of even more value than new consumers is increasing the revenue from those now served. This can be done without any increase in operating costs except coal, as the necessary investment for distribution lines, meter equipment, etc., is installed. Such operating costs as general office expense, meter reading, etc., will not increase appreciably with increased sales to the consumer.

Member companies are now appreciating more fully the value of an efficient sales organization. An example of this is shown by the following personnel of one company operating in a town of approximately 100,000 population.

1—Sales Manager
1—Secretary
1—Clerk
5—District Salesmen (Residence Lighting)
1—Commercial Lighting Salesman
1—Power Engineer
1—Washing and Ironing Machine Specialist
1—Vacuum Cleaner Specialist
3—Sales Clerks

15 Total

The city is divided into five sections, and one salesman is placed in charge of each district or section and held responsible for the development of the residence lighting business. These men are to see that appliances now owned by consumers are in operating condition and are being used. They are to advise as to the wattage lamps the customer should use and wherever possible assist in the selection of lighting fixtures. These men will also secure applications for services, will follow building progress and consult with architects and contractors. It is expected that through this manner convenient outlets will be installed for the use of appliances and other labor-saving devices. These salesmen, in addition to a salary of $100 a month, will be paid a commission on each washing machine, ironing machine and vacuum cleaner that is sold by the company in their respective districts. They will also be paid commissions on house wiring and heating appliances that they sell. The average minimum commission these men are required to earn is $50 a month in addition to their salary. If they cannot secure that amount, it is considered the men are not productive of results. It is hoped that through this method higher grade men may be attracted, and the experience so far obtained justifies the action. Though these men will do good missionary work in interesting customers in such appliances as washing and ironing machines, vacuum cleaners, etc., it is not expected that they will do any demonstrating. The prospects for such appliances requiring demonstration are referred to the specialist. This specialist receives a salary and a fixed commission on each machine sold by the company.

Another condition to be met is in a small community of 1000 to 2000 population. In such towns the earnings will not support a distinct sales department. To meet this situation, one member company reports the employment of women at a guaranteed salary of $25 a month. A commission of 10 per cent is allowed on the sale of all merchandise and 75 cents is paid for each new residence customer. To show what can be accomplished by such effort, we may state that one saleswoman who formerly was employed in the same town at a salary of $25 a month has increased her average earnings to approximately $100 per month. In doing this the central station has not only obtained the profit on the merchandise sold but has also secured the more extensive use of appliances.

A most important problem before central station companies at this time is to find some means of making residence business more profitable. The elimination of empty sockets, further use of electrical appliances, and a thorough saturation of the district served are the principal methods that can be used to produce the desired results.

Respectfully submitted,

C W JOHNSON, Chairman.
EDWIN MANDEVILLE, Vice-Chairman.

C M BENEDICT
J C CHESTNUT
W B CHRISTIE
CHARLES A COLLIER
J F DERGE
S C DOWLING
C J EATON
ROBERT B ELY
F A GALLAGHER
JOHN S HOGAN
A E LENNOX
LEWIS A LEWIS
W A MCKAY
F H MURPHY
FRED H SCHEEL
J H SLADE
H T SPAULDING
F C TAYLOR
G W UZZELL
GEORGE H WATSON
A B WOLLABER

APPENDIX TO RESIDENCE LIGHTING COMMITTEE REPORT

Contract No....................

Agreement for Electric Wiring

THIS AGREEMENT, made between______________________________, of the City of __________________ (hereinafter called the "Contractor") and______________________ of the same place (hereinafter called the Purchaser). WITNESSETH that

THE CONTRACTOR AGREES to furnish the labor and materials to do the work specified on the________floor in building numbered____________________________Street for the prices given in the price schedule on the reverse side of this agreement.

THE PURCHASER AGREES that upon completion of the work he will pay the said contractor, or his Assignees, the amount specified in said price list, for said work, to-wit, the sum of __________________________________ Dollars, ($__________) in the manner described in the following paragraph.

The Purchaser agrees to pay the Contractor twenty-five per cent (25%) or more of said contract price within ten (10) days after the completion of the work, the balance of the contract price $__________, is to be paid to the COMPANY at its office in the City of __________within__________months from the completion of the work in____________equal installments of $____________each, one installment being paid by the Purchaser with each successive month's lighting bill. The Contractor hereby agrees that such payment to the Power Company shall discharge the Purchaser from any and all obligation to pay the Contractor the said balance of the contract price of the work. No interest is charged on deferred payments. Wiring is to be considered personal property and no part of real estate, title to remain in contractor and his assigns until contract price is fully paid.

(Sign here)____________________________________

Purchaser.

Dated____________________, 19____ ____________________________________

Contractor.

The work covered by the foregoing contract has been completed in a satisfactory manner, and is hereby accepted.

Dated____________________, 19____ (Signed)____________________________________

Purchaser.

COMPANY,

__________________,

In consideration of $______________, to me to be paid, I hereby assign, transfer and set over to the Company, all my rights, my title and interest in and to the property mentioned in this contract, and all my rights under this contract.

(Signed)____________________________________

Contractor.

FIG. 1—FRONT OF FORM

PRICE SCHEDULE

LOCATION	OUTLETS				SWITCHES Push Button		SWITCHES Rotary		SWITCHES Snap		BASEBOARD RECEP.		PRICE		REMARKS
	Ceiling Outlet	Lights per Outlet	Side Outlet	Lights per Outlet	S. P.	3-Way	S. P.	3-Way	S. P.	3-Way					
Porch															
Vestibule															
Reception Hall															
Living Room															
Parlor															
Library															
Dining Room															
Kitchen															
Pantry															
Rear Hall															
Rear Porch															
Upper Hall															
Bedroom No. 1															
Bedroom No. 2															
Bedroom No. 3															
Bedroom No. 4															
Bath Room															
Sewing Room															
Rear Hall															
Maid's Room															
Basement															
Attic															
Totals															

All work will be subject to the approval of City Electrical Inspector

No.............

Contract for Wiring

....

AND

....

....Street

....19.....

FIG. 2—REVERSE SIDE

Name　　　　　　　　　　　　　　　　Date

Address

Information

LOCATION	Ceiling Outlet	Lights per Outlet	Side Outlet	Lights per Outlet	S. P. Switches	3 Way Switches	B. B. Recep.	PRICE	
Porch									
Vestibule									
Reception Hall									
Living Room									
Parlor									
Library									
Dining Room									
Kitchen									
Pantry									
Rear Hall									
Rear Porch									
Upper Hall									
Bedroom No. 1									
Bedroom No. 2									
Bedroom No. 3									
Bedroom No. 4									
Bath Room									
Sewing Room									
Rear Hall									
Maid's Room									
Basement									
Attic									
TOTALS									

Credit				
		Outlets		
		S. P. Switches		
		3 Way Switches		
		Edison B. B. Recep.		
Service		Charge for Circuits		
		TOTAL		
		Contract Price		

Name　　　　　　　　　　　　　　　　Date

Address

Contractor

Amount to Collect

Bill to Power Co.

Remarks

FIG. 3.—SALESMAN'S WORKING PAGE

FORMS AND RULES ON FINANCING EXTENSIONS

The Company agrees to set aside on the 31st of December of each year 10 per cent of bills paid by the Consumer for electricity for a period of one year, or since installation of service, if less than a year, at the said location, and to pay to the Consumer from the amount so set aside interest at the rate of 6 per cent per annum on his advance at that time remaining unrefunded, but interest on such advance shall be paid only out of the said 10 per cent of the Consumer's bills for each period, and shall not in any period exceed the amount of said 10 per cent of the bills for that period. The excess of said fund over and above 6 per cent interest on said advance shall be paid by the Company to the Consumer, and shall be credited to the Company as a repayment to that extent on account of said advance. When the Consumer's entire outstanding advance shall have been refunded to him then this agreement shall be automatically terminated and no further deductions shall be made from the Consumer's bills for electricity.

FINANCING SERVICE EXTENSION

In consideration of the fact that the expense to the Company for lines and equipment necessary to supply this customer with electricity is considerably in excess of the normal cost thereof, and in further consideration of the difficulty, under existing conditions, of financing extensions to the Company's equipment, the customer hereby agrees to pay to the Company a sum equal to the full cost of the necessary lines and equipment. Such portion of such sum as shall represent the excess cost of the above mentioned lines and equipment, over and above the normal cost thereof, as of July 1, 1914, shall be retained by the Company. The balance thereof, known as the normal cost, shall be refunded to the customer annually at the rate of twenty dollars ($20.00) for every one hundred dollars ($100.00) paid to the Company for electricity used by the customer at this location. The Company agrees to pay interest at the rate of 6 per centum (6%) per annum on any unrefunded balance of the normal cost. After the expiration of five years from the first commencement of supply hereunder, any unrefunded balance of the normal cost shall become and remain the property of the Company. The Company reserves the right to refund at any time all or any part of the unrefunded portion of said normal cost.

RECEIPT FOR PAYMENT ON LINE EXTENSION FOR ELECTRIC SERVICE

________________ 191___

Received from ________________ herein called the Consumer, ________________ Dollars ($________) as a payment to apply on the cost of extending this Company's distribution line to render electric service to the premises at ________________ under contract No.________ for service dated ________________ 191___

All or part of the above payment will be refunded to the Consumer under the following conditions:

There will be refunded to the above Consumer, in annual installments, a sum equivalent to that amount by which the revenue derived from the service to the Cousumer during the preceeding year exceeds the standard tariff minimum charge applicable to such service.

Should additional consumers be subsequently added to the extension, the refund shall be increased in that amount by which the revenue derived from the services to the additional consumers exceeds the standard tariff minimum charges applicable to such services.

Where two or more consumers united in advancing the cost of the extension, as provided above, that portion of the refund due to the revenue derived from subsequent additional consumers will be distributed among the original consumers in proportion to the amounts advanced by each.

In no event, however, is such refund to continue for more than five years from the commencement of service, any unrefunded balance remaining at that time to revert to the company, nor is the total of such refund to exceed the total amount advanced by the Consumer.

Title and ownership in the extension will remain at all times vested in the Company.

By ________________

The foregoing receipt correctly recites the conditions under which the payment therein mentioned is made.

By ________________
Consumer.

TERMS AND CONDITIONS COVERING LINE EXTENSION

Upon request to the Company to furnish service for light or power, or both, at a location where it is necessary for the Company to make main or distribution line extensions of any character, the prospective Consumer shall deposit with the Company, in advance, an amount of money equal to the total estimated cost of such main or distribution line extension, which deposit will be adjusted to the actual cost, through refund by the Company, or additional deposit by the Consumer, when the actual cost is determined.

When such a deposit is made with the Company by a prospective Consumer, the Company will refund to the depositor a sum not to exceed the actual cost, at the rate of 40 per cent of the annual gross revenue accruing from such extension. Settlement will be made with the depositor semi-annually, February 1st and August 1st, until such time as the total actual cost is refunded, provided the revenue from the extension is sufficient within ten years for the above specified portion of it to cover this amount. No refunds will be made for a longer period than ten years.

Nothing herein contained shall in any manner be construed as conferring upon the depositor any title or right or equity in main or distribution line extensions.

FIVE YEAR DEPOSIT AGREEMENT

________________District. ________________19____

To Company:

Upon the understanding that you will at your own cost and expense, subject to my obtaining if necessary the right-of-way, extend your electric lines as follows:

MUNICIPALITY________________

NAME OF STREET	FROM	TO

I herewith pay you the sum of________________Dollars, which amount is to be returned to me in five equal yearly installments beginning one year after service is furnished and used by me, provided however that no installment shall exceed 50% of the income from said extension during such service year, together with interest at the rate of 6% per annum on the amount of such installment. The 5th installment is to be adjusted if necessary so that the total amount returned exclusive of interest shall equal 50% of the income from said extension during the five service years, but in no case to exceed the amount originally paid by me. Upon receiving the 5th installment as above, I agree that all further payment shall cease and determine notwithstanding that the five installments exclusive of interest may not equal the amount originally paid by me.

NAME OF CUSTOMER	STREET AND NO. OR OTHER DESIGNATION

I make this payment solely that I may have the convenience of the use of electricity and for the improvement of my property, and I clearly understand that by such payment I acquire no interest whatever in the line which you may build in pursuance of this request.

____
(Sign full name here)

Received the above sum of $________________subject to the above mentioned conditions.

By________________Agent.

DR.						LEDGER MEMORANDA OF DEPOSIT AND REFUND.		CR.

ORIGINAL—Company Copy

ELECTRIC LINE EXTENSION AGREEMENT

Agreement made and entered into this..........day of........................, 191 ,
by and between...............................hereinafter called "Company," party of the first part,
and ....
hereinafter called "Consumer," party of the second part,

Witnesseth:

WHEREAS, Consumer wishes to obtain a supply of electric energy at.....................
...............................and requests Company to make necessary extension to render the service; and

WHEREAS, the cost of extensions and the cost to the Company of borrowing money to pay therefor is excessively high because of the war, but the Consumer is desirous of obtaining service forthwith, and for that purpose is willing to pay such cost so far as the same may exceed the "pre-war" cost.

NOW, THEREFORE, in consideration of the promises and the undertakings hereinafter set forth, the parties do agree as follows:

ESTIMATED PRESENT COST

Attached hereto is an estimate of the cost of the extension at present prices which amounts to $..................

ESTIMATED PRE-WAR COST

Attached hereto is a corresponding estimate of the cost of said extension on the basis of prices during the "pre-war" period (*i. e.*, average during years 1911, 1912 and 1913) which amounts to $................

DEPOSIT

Consumer agrees upon the execution hereof to deposit with the Company an amount equal to the estimated present cost.

FINAL ANALYSIS OF COST

Within twenty days from date of completion of the work an itemized statement of the actual cost will be made to the Consumer, and upon the presentation of such statement the Consumer agrees to pay any sum that such actual cost may exceed the deposit, and the Company agrees to refund any sum by which the deposit may exceed such actual cost. From this statement of total actual cost, the corresponding "pre-war" cost based upon the "pre-war" unit prices used in the estimate will be ascertained. Final statement will then be presented to Consumer and amount of "pre-war" cost shown thereon will be credited to Consumer's account.

The actual cost shall include ten per cent. (10%) for general supervision, use of tools, storage and handling of material, accounting and other elements of expense.

COMMENCEMENT OF WORK

Upon execution hereof and receipt of deposit, the Company will immediately place orders for all material, and use every effort speedily to complete the work.

REIMBURSEMENT TO CONSUMER

The Company will refund to the Consumer the "pre-war" cost of the extension by crediting upon Consumer's monthly bills for electric energy forty per cent. (40%) of such monthly bills until the full amount of such "pre-war" cost with interest at six per cent. (6%) per annum shall have been refunded, and the Consumer agrees to use sufficient electric energy during the three years next after the commencement of service so that forty per cent. (40%) of the charges therefor will equal such "pre-war" cost and interest thereon, but in case Consumer fails so to do the Company is released from any and all liability on account thereof.

TITLE

The title to the extension herein provided for shall vest in and belong to the Company.

IN WITNESS WHEREOF, the parties hereunto have considered this agreement to be duly executed the day and year first above written.

.... COMPANY.

By ....

....
Consumer.

LINE EXTENSION AGREEMENT—PAGE 2

DETAILS OF COST

ITEMS OF MATERIAL AND LABOR REQUIRED	Estimated Cost of Construction at Present Prices 1	Actual Cost of Construction as Installed 2	Estimated Cost of Construction based on Pre-War Prices 1A	Actual Cost of Construction based on Pre-War Prices applied to Material and Labor Used 2A
Total of above items.				
10% of Total for Engineering, Supervision use of Tools and Equipment, etc.				
TOTAL				

LINE EXTENSION AGREEMENT—PAGE 3

ACCOUNTING MEMORANDA

1—Estimated Cost of Construction at present prices (Original Deposit Received) $________

2—Actual Cost of Construction as installed (Corrected Amount of Total Deposit) $________

3—Additional Amount to be Collected from (Red) or amount to be returned to Consumer (Black) (1-2) . . . . $________

4—Actual Cost of Construction based on Pre-War Costs (Amount to be refunded on monthly basis) . . . . $________

Deposit Payable—Interest Allowance and Refunds

Month and Year	Balance due 1st of Month			Monthly Interest Allowance	Total due end of Month	Monthly Refund 40% of Bill	REMARKS
	Account of Deposit	Account of Interest	Total				

LINE EXTENSION AGREEMENT—PAGE 4

THE CHAIRMAN: Mr. Pembleton?

F. D. PEMBLETON, Newark, N. J.: Mr. Chairman, it seems to me that one phase of residence lighting has not been developed to the extent that it might be; that is, the decorative as well as the utilitarian features of portable lamp lighting. Until very recently the general lamp public has known very little about illumination. Now that the public is learning about it, the women are taking it up from a decorative point of view, as every woman has a very strong desire to have her home look beautiful.

There are three phases of portable lamp lighting that recommend the development of this branch of the lighting business. First of all, there is a profit on the sale of the lamp; secondly, there is a profit to the wireman who is usually called in to make outlets in base boards in different parts of the room where the portable lamp may be attached; and thirdly, there is the decorative feature as well as the feature of hygiene in protecting the eyesight.

I believe that every central station that is in any way interested in the sale of appliances, including portable lamps, and all of the other interests concerned, should get behind a national movement to develop portable lamp lighting. It offers a very attractive field for everyone. It will arouse more interest in home lighting; it will make home lighting a part of the home decorations; it will make the home lighting add to the comfort and attractions of the home as a most desirable place in which to spend your time.

I believe it would be a very practical feature to every one to bring about a more general interest in that phase of lighting.

THE CHAIRMAN: Mr. Gibbs, will you say something?

L. D. GIBBS, Boston: All classes of business are good and worth taking, providing you can take them at a proper rate. But it never has seemed to me a good idea to carry on a general advertising campaign to interest people in having their houses wired, because you get inquiries from many people for whom you don't feel that you can afford to make the extensions, and some of your inquiries will therefore have to be put aside.

It is usually most satisfactory to develop the business of house wiring by circularizing with letters, folders and the publications of the Commercial Section, sent to selected lists, secured by either the electrical engineering department, whose staff will know where the lines run, or by the salesmen in the sales department. In that way you reach people directly, you are able to address them in a rather personal way, and it is easy to make the necessary impression on them without a great deal of lost advertising material and lost effort.

Old-house wiring contracts are, of course, familiar to all of us. We have through the superintendent of our sales department developed a scheme by means of which the salesmen in that department work with the contractor, helping him to get the contract closed, and then after the contract has been closed, it is taken care of by the contractor with the person who has had the house wired.

Why not arrange something in the way of a house wiring contract for new houses, adapted particularly to the individuals who are building their own homes? These people are making a considerable expenditure in building their home, and if some arrangement could be made so that that part of the improvement and development could be handled easily, oftentimes people would put in more electric fixtures and outlets without so much argument and so much selling effort.

I think it is important in developing business in residence lighting among the existing customers not to attempt to over-develop the business. It reminds me of pictures we have seen of a house the first night after the electricity was turned on; it would be bright from cellar to garret, and the next picture shows it later on, with one light, perhaps, in the picture.

We can very easily produce a bad impression and an unfavorable attitude toward the central station by over persuasion in getting people to think that they can't live unless they have a lot of lighting in their homes. What they want is comfortable, convenient light, and as Mr. Pembleton has said, light that can be adapted to any of the conditions and used under any situation.

THE CHAIRMAN: The paper is now open for general discussion.

C. G. DURFEE, Rochester, N. Y.: With reference to what the last speaker has said about people illuminating their whole house brilliantly and then receiving the first bill and cutting out all light except that absolutely necessary, I find that the average person dislikes to pay real money for necessities, whereas they don't care how much money they spend for luxuries.

Now I have known of numbers of ladies in Rochester who would complain bitterly about a matter of fifty cents or a dollar one way or the other when they were talking about a bill for the absolutely necessary light in a room, hallway, porch or whatever it may be. Yet if you can get that same woman interested in something ornamental, something that she is proud to show off—an electric fountain on her table or an ornamental table lamp, anything that makes a nice ornament to show or helps decorate the house, something that she is proud of when company comes in, she won't care if the bill is $10 a month; it is worth it.

I think the same thing would apply if the lady went out to buy a kitchen apron; if somebody charged her ten cents more than that apron was worth she would have a fit. If she went out to buy a ball gown, she would be particular to select the gown which suited her but would not be greatly concerned over the cost; she would let hubby worry about the bill. You will find that that is human nature, and I believe if you want to increase the revenue from your customers, the thing to do is to educate the architects. I find that the architect knows less about the proper way to wire buildings than any other man interested. He draws up very elaborate specifications for everything else except the location of outlets and switches in the building and then leaves that to the contractor. He merely says two outlets in this room, two in that, so many in the dining room, so many in the parlor, etc. The contractor who puts in the lowest bid gets the contract and he puts the outlets wherever they best suit him.

I have seen dozens of houses built in Rochester in which, when the people moved in and started to arrange the furniture, they found the only outlet on the sidewall was in the one spot where the bed could be put. The bed could not go anywhere else, and consequently the lamp would be behind the headboard of the bed, whereas the lady wants it beside the dresser. The wireman did not know where the dresser was going and did not care. He had a contract for one outlet; he put it in and got his money.

You should get the architects not only to locate the lamps in the proper places but also to specify proper base receptacles. I think you will all agree if the lamp is properly situated it will be utilized more than if improperly situated, and if the switch is properly located it will be turned on more frequently. If you educate the architects to specify such wall or base receptacles as could be utilized and arrange them so that when the tenant or the owner comes into the house, the question confronts him, "What is this or that receptacle for?" when he learns that this receptacle is for a flat iron, these two or three are for portable table lamps, and this one is for a portable vacuum cleaner, he will start right in to buy some or all of these appliances. He has the wiring and the receptacle and he wants to use them. The receptacle is a suggestion, it is a silent salesman. It is difficult for a salesman to go around and induce customers to buy electrical appliances and then discover that the customer cannot use them without spending a prohibitive amount of money for wiring, base receptacles, etc.

I believe if you can get every house properly wired and equipped with the proper receptacles for every kind of an appliance that you want to get in the house, the appliances will automatically go in.

D. A. Hegarty, Boulder, Colo.: In discussing this question of receptacles or socket openings in buildings, the basis of rates on current, of course, has to be taken into consideration, for if the rates are on a demand or primary or secondary basis, there is a penalty for socket openings, and for this reason architects or engineers planning the lighting installation, advise the installation of a minimum of socket openings.

To encourage the installation of socket openings, the rates will have to be changed so they will not penalize the consumer for socket openings.

G. H. Stickney, Harrison, N. J.: Having proper lighting specified by the architect does not necessarily insure its installation. The electrical contractor has a very considerable influence on what is actually put in. Competitive bidding sometimes leads contractors to recommend a minimum number of outlets and cheap equipment rather than what will prove most useful in the long run. Wall switches and baseboard outlets are among the important advantages of electric lighting in the home and increase the pleasure and comfort to be derived from the service. The baseboard outlet not only provides well for fan motors, electric heating and other devices, but also for portable lamps. Portable lamps add much to the cheerfulness and homeliness of a room. Contractors should be recommending the addition of such features.

On one occasion when a stranger was having difficulty in finding the switch in a dark room, the owner showed him how by grasping the door knob and forming a fixed radius about the hinges he could grasp the switch chain hanging from a chandelier. But how much better would it have been to have a switch near the door—and considering the years of use, how inexpensive! The contractors' associations can do much toward encouraging better methods, but it would seem that each central station company could well take an interest in encouraging all local contractors to boost for the best practice, and in so doing not only increase their own business but also the opportunities for further electric service.

N. H. Boynton, Cleveland: This discussion of educating the contractor and educating the architect, I think, is pretty well taken care of if you educate the public. If the public understands the convenience of the light and appliances and makes a demand on the architect, the contractor and the architect are anxious to give the public what it wants.

More advertising, more sales effort on specific problems of this kind will get further than general advertising of electric light and electric appliances. I just want to make the point that the public is the party in whom we can make the biggest dent and accomplish the greatest result.

Wm. B. Christie, Trenton, N. J.: I disagree with the second speaker that central stations should go into the wiring game if they have competent contractors in the city. The contractors in the city, who are not antagonistic to the central stations, can do a whole lot more in getting old houses, which are on our existing lines, wired than the central station itself. With electrical contractors' associations and electric clubs fostering that work, together with the central stations, more can be done than by the central stations doing the wiring themselves.

I can't agree, either, with the speaker's statement that we should cut down the light. I think every one wants to see the meter go around, that is those in the central station game, and if the people who are using the light get the goods for their money, they are willing to pay the price. I think sometimes the bills are high, due to the fact that the wrong voltage lamps are used in the sockets. That is the central station's job or the salesman's job, to see that the proper wattage lamps are recommended and used.

E. MANDEVILLE, Worcester, Mass.:* Referring to the percentages on page 147, the war affected our gain in Worcester as follows:

Percentage of gain	
1915	26.7
1916	33.8
1917	21.7
1918	11.8

While our percentage of gain in residence customers for 1917 was but 21.7 per cent, our revenue increase in 1917 was 32.4 per cent. Our 1918 increase of residence customers was 11.8 per cent and our revenue increase for the same time was 16 per cent. We attribute our increases in revenue largely to the constant pushing of appliances, small heaters, etc., by the contractor-dealers and ourselves, for the past two years. We did not increase our rates during the war while the Gas Company did. This also helped us.

Referring to page 149, question E, we are now making a house to house canvass, calling on our lighting customers and inquiring if our service is satisfactory, if their appliances are in good working order and if their lamps give them sufficient light, if lamp sockets are all filled, etc. We know from the results already obtained that the expense will be trifling compared to the revenue we derive.

* Written discussion as writer did not attend convention.

I would like to hear what other companies do along this line and particularly along the line of increasing the bills of customers who do not reach or exceed their minimum charge.

Referring to the last paragraph on page 150, we are always able to obtain sufficient profit on our house-wiring contracts. Our contractors are glad to deduct from the total amount of any contract from 7 to 10 per cent. They say that no time spent in getting the business and their cash within a few days after completing the job is well worth the reduction. We collect 25 per cent in advance with all contracts and allow balance to be paid in twelve monthly payments, our company carrying the accounts.

CHAIRMAN: I will ask Mr. Johnson if he will close the discussion.

MR. JOHNSON: Undoubtedly the most important work the commercial man has before him is first to sell better residence lighting to his own organization. We have perhaps been too keenly interested in the large power business and have failed to realize that our heavy investment in distribution lines could be made more profitable through thorough saturation. This is of immense importance as a large factor in cost of residence lighting is the fixed charges on our distribution line investment.

THE CHAIRMAN: I will ask Mr. Durfee if he will present his report on the Commercial Aspects of Street and Highway Lighting.

REPORT OF CHAIRMAN OF COMMITTEE ON COMMERCIAL ASPECTS OF STREET AND HIGHWAY LIGHTING*

As no opportunity was afforded at the 1917 Convention for a discussion of that year's report of the Committee on Commercial Aspects of Street and Highway Lighting, your Committee desires to call attention to that report and invite discussion of it at this convention.

Your Committee commenced its activities this year with the intention of presenting at this convention a report that would be somewhat in the nature of a handbook for the information and guidance of new business departments in securing new business in the lighting of streets and highways, recommending methods of obtaining contracts for replacing old and obsolete lighting systems with new and up-to-date systems and also for the lighting of highways between cities and the outlying towns and villages.

In order that such report should be practicable rather than theoretical and idealistic, your Committee started out to study conditions throughout the country with a view to obtaining sufficient information to enable it to advise not only what should be done in the use of street and highway lighting, but (what is equally, or more, important) what should not be done.

Your Committee feels that the time is opportune for the introduction of the subject of highway lighting, particularly as it applies to highways between important centers over which automobile express routes are or may be established. These auto trucks are now, as a rule, equipped with high power headlights. The use of the high power headlight on automobiles is in many ways objectionable and would be unnecessary if the highways were properly illuminated.

There is an increasing demand for electricity on the farm, but probably the greatest drawback to the development of this business is the fact that the farms are so large and scattered that in order to reach them with electricity the necessary invest-

*Not printed in advance of convention.

ment in line extension would be far greater than would be justified by the amount of revenue obtained.

If, however, lighting districts are established reaching out into the suburban and farming districts, the revenue from highway lighting plus the revenue obtainable from the use of light and power on the farms, would make the undertaking profitable.

(Signed) C. G. DURFEE, Chairman.

MR. DURFEE: I made this report brief, merely calling your attention to last year's report. I do not want to take up your time because I think that it can be more profitably spent in discussion.

I do want to state, however, that the succeeding Committee, if it follows out the plan which this Committee has arranged, will next year call upon central station managers in various parts of the country, in such towns and cities as have been very progressive in everything other than street lighting, where the progress of street lighting has consisted of putting in one more lamp of the old type whenever a few more houses were built, to replace the old types with something more modern. They now have a larger number of lamps, but still the same old type of lamp that they used ten or fifteen years ago, and no attempt has been made to scrap the old installation and put in an up-to-date installation to make the street lighting match progress in other directions.

Now, what our Committee would like to see done next year is to pick out certain cities and towns and get the central station manager to install one block of proper lighting, either in the business district or in the residential district. The Committee would suggest that the manager call upon the Committee and allow it to make suggestions, to give the benefit of its experience and to suggest the type of lamps for lighting the particular class of street or highway under consideration; also the spacing of the lamps, the height of the lamps, etc.

Experience has convinced me that in a town where the lighting is obsolete, where the residential lighting does not keep pace with the business lighting, if you will go into a new neighborhood where there are some good, snappy houses being built, put in three or four standards, or put in a block of the lighting best suited for that particular class of neighborhood and leave it there for a month, you will find that some lady on the next street will come to call on a lady in this street, and when she leaves that evening she will say to her husband, "Say, Jim, that is pretty nice street lighting; you know it kind of shines that street all up and makes the houses look better. Why can't we have that on our street? We have a lot of old tallow dips down there that have been there for the last fifteen years. You know the alderman pretty well, why don't you get after him and tell him that we want some decent lighting; we want to be on the map and know we are alive." Pretty soon he and several others get after the alderman, who asks the lighting company what it would cost to equip the other street with that class of lighting. The result is that the lighting company and the city engineers get together and the new lamps are ordered in. You have only to equip one of two streets before you get all the other people jealous.

In Rochester we started several years ago to put up some ornamental standards, or, rather, ornamental concrete posts with brass tops and ball globes with the wires underground instead of having them hanging all over the streets; we removed the poles from the streets and put them in back lot lines. We hadn't many streets so equipped before the people in adjacent streets began to complain to their alderman; they wanted to know why they could not get the poles off their street; why they could not get concrete lamp posts and ornamental lamps, and so forth. The result was that we put up several thousand of that class of lamp and most of those lamps have been demanded by the people.

I do not want to take up any more time. I would like to ask every central station manager who contemplates doing something to bring his street lighting up to date or to branch out and do highway lighting, to call on this Committee and give it an opportunity to advise him as to the type of lamps, the spacing, height and so forth. Whether you take the Committee's advice or not, that is not here nor there. It does not cost anything to ask for advice and perhaps the Committee can be of some service to you. Thank you, gentlemen. (Applause.)

THE CHAIRMAN: Mr. Halvorson, will you discuss this report?

C. A. B. HALVORSON, West Lynn, Mass.: I have not given this matter particular thought, but it does occur to me that central stations in general do not give proper attention to the importance of street lighting. I don't know why central stations should permit the most conspicuous part of their business in many cases to go without any particular attention. In the section that I come from, New England, central station managers are thoroughly alive to the importance of good street lighting. They lead in the movement for good street lighting; they encourage good street lighting. Usually they start in the business center with intensive street lighting, the object being to increase the levels of illumination. When the business center is well illuminated, great benefits come to the central station through the increased illumination of store windows and display lighting of all kinds, and naturally the next zone, that is, the zone surrounding the business district, is benefited, increased illumination takes place there, and so on, until finally we come to the highways, and in this way the entire community benefits.

I do think the central stations should study this most important branch of their business, because in nine cases out of ten agitation against the central station starts due to unsatisfactory street lighting.

THE CHAIRMAN: Mr. Millar, do you care to say anything?

P. S. MILLAR, New York City: The thought that was in my mind as Mr. Durfee was presenting his report is that there is a tendency in certain parts of the country to put in too small a street lighting unit when substituting newer types of fixtures. Too small a street lighting unit means a downward influence in the intensity of the store lighting and that is reflected in the illumination required for residences in the city. The arc lamp was, as a rule, a unit of one or two sizes. The question of a little more or a little less power in each unit did not arise in the case of the arc lamp; but when the tungsten lamp is available in so many different sizes, not separated in very large steps, the temptation is always before the municipality to save a little money by putting in a smaller lamp. It seems to me that we all ought to work in opposition to that tendency.

THE CHAIRMAN: Mr. Ryan, will you say something?

WALTER D'ARCY RYAN, Schenectady, N. Y.: Mr. Chairman and gentlemen, at the 37th Convention of this Association, held at Philadelphia in 1914, I outlined a proposition for highway lighting from New York to Buffalo by the so-called upper and lower routes and referred to a chart which I prepared in 1911 showing the distance which each station would have to extend its lines to the midway point in the intervals between cities; I was greatly surprised to find that these distances were extremely short, the maximum being approximately 25 miles. It was proposed to install 250 candle-power lamps, about 150 feet apart and 30 or 40 feet above the ground, enclosed in a reflector of the type designed for the lighting of the Panama Canal, which distributes the light up and down the street and cuts it off at an interval of 10 feet to the rear of the lamp and at the same time acts as a screen to prevent the direct rays from entering the eyes of the traveling public. It was also suggested at that time that a lamp of approximately 500 candle-power be used in order to emphasize the cross streets and thereby minimize accidents.

I would like to say a few words in reference to intensive white way lighting, that is lighting where the merchants and property owners contribute a relatively large proportion of the cost of installation and operation, in order to give the business street unusual prominence and brilliancy. Standards of a monumental character are used, giving a pleasing effect by day as well as at night and in a degree far in excess of that ordinarily used for street lighting. The first installation of this class was in Salt Lake City, where high current luminous arcs were used three to a pole, approximately 25 feet high and spaced about 110 feet apart and opposite. The second installation of this character was the so-called Path of Gold in San Francisco, which has since been followed by the Triangle Business District where two lights are used per standard. At the present time a very elaborate system is under consideration for Canal Street, New Orleans. The initial cost of installations of the type mentioned runs anywhere from $50,000 to $100,000 per street mile, depending upon magnitude and local conditions. Now such lighting systems raise the standard of illumination not only on the particular street illuminated but on all other streets, electric signs, stores, store windows and even in the homes. Two weeks after the Path of Gold was installed in San Francisco the billboard people issued an order to raise the illumination 50 per cent, in order to maintain proper punch or contrast.

I have an interesting editorial here which appeared in the May 1st issue of the Journal of Electricity. I believe it is important at this time because it applies to arc lamps. Unfortunately certain central stations have the idea that the arc lamp is a dead issue. Nothing could be further from the facts. For intensive street lighting it stands supreme, because of its high efficiency, brilliancy and life and white quality. It forms an excellent contrast with the window illuminations and sign lighting. We cannot use the incandescent lamps successfully for everything any more than we can the arc lamp. Where a great volume of light is required, the 6.6 ampere luminous arc (high power) is the most efficient, least expensive to operate and best all around unit that we have. The low current luminous arc, that is the 4 ampere, has less to recommend its use on the basis of the present high efficiency of the tungsten lamps, except where the life and whiteness of the light are particularly desirable. All things being equal, and taking into consideration the general central station equipments, it would probably be advantageous to use the incandescent lamp, but where an installation of arcs is already in, it would be perfectly absurd under ordinary circumstances to throw these out and substitute incandescent lamps. In nine cases out of ten it would be a serious mistake, especially where incandescent lamps of considerably less candle-power are substituted, and such changes under contemplation have recently been brought to my attention. This would merely lower the general standard of illumination, which is working in the wrong direction, not only for the central stations but also for the public. Now I am not trying to favor one system or the other, I am simply attempting to correct a false impression that the tungsten lamp is in all cases equal to the arc lamp in efficiency and effectiveness and that it will soon supersede it for all classes of lighting.

During the war period some very important development has taken place which has greatly increased the efficiency of the luminous arc by the use of the so-called high efficiency electrode. The 4 ampere lamp, taking the same energy as at the present time, can be raised in efficiency 55 per cent, and of course an equal increase can also be obtained by using high efficiency electrodes in the higher current lamps. In cases where it is desirable to increase the number of lamps per circuit without making any change in the present station equipment, this can be done by using a high efficiency electrode and lowering the wattage at the lamp, so that 85 or 90 lamps can be operated from the 75 light transformers and at the same time the lamps will give 10 per cent more light than the present standard, where they are operating at 75 to 80 volts in place of 65 to 70. Furthermore, the designing engineers have finally perfected a cutout which they claim is now satisfactory for the operation of incandescent lamps in series with magnetite arcs. In other words the magnetite arc lamp has become flexible. While certain improvements have been made, especially in efficiencies of the arc lamp, the development of a new series incandescent street lighting system has been perfected. I am not in a position to go into detail at the present time, more than to say that it has to do mostly with control, new glassware and standard designs. I believe that this system will do a great deal to revolutionize the incandescent white way lighting. I look for a wonderful future in both the arc and incandescent street lighting during the next few years. From all over the country requests are coming in which indicate that street illumination is in the near future to be given unusual consideration throughout the country.

(Mr. Ryan then read the following editorial and presented a few lantern slides illustrating intensive street lighting in Los Angeles, San Francisco and other cities.)

THE TRIANGLE LIGHTING DISTRICT

"Ever since the dazzling beauty of the Panama-Pacific International Exposition set new standards of illumination that not only proved of tantalizing beauty but of increased usefulness in turning night time into day time, the business world has watched with increasing interest each new development in the matter of scientific illumination.

"The first great practical result of the lighting effects of the Panama-Pacific International Exposition came about in the use of projectors for the industrial activities of the Nation during the trying period of the war. Side by side with this phase of development has gone the matter of effective street illumination. In San Francisco the Down Town Association, an organization composed of the best known business men in this city, has devoted unusual study to the question. The result has been the establishment of new advances in street illumination. On other pages of this issue interesting accounts are given of these new advances by one of the engineers engaged in the work and a second article by Mr. Fennimore, past-president of the Down Town Association and chairman of the Lighting Committee that undertook the new work recorded in these articles just referred to. Mr. Fennimore's discussion represents the business man's viewpoint and adds an interesting angle to the consideration of the subject.

"The Path of Gold on Market Street and the Triangle Lighting installation in the same neighborhood constitute systems of illumination of which the West may well be proud. While it is true that statistics just made public by the Census Bureau at Washington show that arc lamps as a class decreased in number from 348,643 in 1912 to 256,838 in 1917, and that incandescent lamps increased from 681,957 in 1912 to 1,389,382 in 1917, this fact in itself does not in any manner condemn the arc lamp for street lighting in those fields of usefulness where it has demonstrated its unquestioned superiority.

"In passing down Market Street to the Ferry Building during the evening hours it must be admitted that for intensive white way or high power work this installation has distinct advantages of quality, life and sparkle, contrast with the window and sign lights, higher efficiency and relatively low maintenance cost.

"In summing up these new advances in street illumination it is safe to say that once again the West may take a sense of pride in saying that within its confines have been established new records that not only add distinct contributions to effective illumination, but from an esthetic point of view, during the day as well as the night, the city beautiful has been passed up to higher standards of attainment."

THE CHAIRMAN: I will ask Mr. Durfee to close the discussion.

MR. DURFEE: I haven't anything particular to say in closing. I might mention that in Rochester, where most of our ornamental standards in the residential district have been equipped with 80 candle-power lamps, some time ago we started out to raise the standard a little and equip some lamps in new streets with 200 candle-power lamps, and since that time, as a rule, the residents and the city generally want the 200 candle power. Now, all the new lamps are more apt to be 200 candle power in the residential streets than 80 candle power. That is along the line that Mr. Millar suggested.

D. A. HEGARTY, Boulder, Col.: I would like to suggest to the Committee that when taking up this street lighting question next year and sending out questionnaires, the attention of the central stations be called to the fact that in street lighting they indicate whether they are selling illumination or ornamentation.

At conventions held a number of years ago at the time the central station companies were recommending the five light standards for illumination, especially in the business portion of cities, there were very spirited discussions regarding them, and the stand was taken that except on special occasions in a very few isolated cases, the five light standards should not be used, as they were only wasting light. I am more thoroughly convinced than ever of the stand taken at that time. I have just come across the country to this Convention and I noticed that in almost every town where five light standards were used, four of the lights were not burning and only one light was burning, and this condition in nearly all cases was after the first year of installation.

On making inquiry it appeared that in the business districts in most of the cities the business people paid for the installation of these posts and five light standards were put in on recommendation of the central station companies. The business men paid for this illumination by assessments among themselves for the first year or so and then got the City to agree to pay for it. As soon as the City had to take over this bill, it was confronted with the fact that other districts wanted street illumination. These requests could not be complied with as the funds to pay for street lighting were not at the disposal of the city. Immediately the residents without street lighting brought out the fact that they could not get lights whereas down in the business district lights were being wasted, and as they were all taxed in the same proportion, they felt they were being discriminated against. Furthermore in the residential sections where the voting population is, street lighting was wanted, and in order to find favor with these residents the City officials have ordered less illumination in the business district and better distribution of illumination by placing these lamps in other parts of the city and cutting the light down to one light a post instead of five as formerly.

When I was chairman of the Illumination Committee of the American Society of Municipal Improvements, I came across this condition in a great many cities in the country. The Mayors and Municipal Electricians of the different cities advised that the people were complaining that they could not get street lights out in the residential part of the city while down in the business portions they were wasting lights.

Now, we all know that five lights on a post in a great majority of cases is just ornamental light and that is what the people are paying for and not illumination. I feel that this is a matter of vital importance to the public and also to all central stations, and that it is not very good advertising for any light company to have four of these lights "dead" and only one illuminated.

I am sure that every one will agree with me that a single light standard is much more ornamental and decorative to a town than five-light standard posts. I know the views of such eminent men as Mr. Kessler, city planning engineer, as I worked with him in designing the lighting system when he was engineer for city improvements. He is favorable to the single light standard instead of large, top-heavy, five-light standards. This style of lighting has been installed both at Washington, D. C., and Indianapolis, Ind., and the system blends right in with the scenery and does not intrude with a jar on your sensibilities like large top-heavy, five-light posts. I think much better results can be obtained and more thought should be given to street lighting, taking into consideration the illumination, designing of standards and the location and surroundings.

Mr. Durfee: Mr. Chairman, I would like to answer the last speaker. I just want to say that the Committee, wherever it has had the opportunity, has cited that as one of the things not to do, and I think you will find that everybody is pretty well agreed now that is not ornamental. People started out thinking it was, but they have learned that it is not, and that sort of thing is not being done at the present time.

The Chairman: The next committee report will be that of the Outdoor Lighting Committee, Mr. H. H. Magdsick of the National Lamp Works, Cleveland, Ohio, Vice-Chairman.

REPORT OF COMMITTEE ON OUTDOOR LIGHTING

The first report of this Sub-Committee presented at the 1917 Convention outlined numerous opportunities for the development of the outdoor lighting load, especially as these had been brought about through the application of projected light. Various equipments which had been designed for this service were reviewed in detail and their application illustrated by many examples suggesting opportunities for every central station, large or small. As was pointed out in that report, no concentrated organized sales effort, characteristic of the development of other central station revenue producers, had as yet been made in the field of outdoor lighting.

Commercially, the situation is no different today, for with the outbreak of the war every effort was turned to the things most directly concerned with its successful prosecution. The equipments and the knowledge gained in their utilization for outdoor lighting purposes were at once turned to the protection of the industrial plants, the ship yards, transportation systems, public buildings and the establishments of the Army and Navy, whose preservation was so essential to the success of the national effort. The Military Intelligence at once recognized that light is a major factor in protection, the most important auxiliary of the armed guard. It realized the inability of its own organization to promote the proper application of lighting equipment in this service, and, stating that the subject was not understood by the managements of the various properties requiring protection, called upon the lighting men of the country to come to its aid and shoulder this responsibility. Similarly, the men skilled in the solving of outdoor lighting problems and the manufacturers of equipment were called upon to meet many military requirements, such as the lighting for night flying, landing of dirigibles, etc.

Through all of these activities, equipments available for building up central station business have been extended and improved. Today the opportunity for their application in outdoor illumination of night work or recreation, of monumental struc-

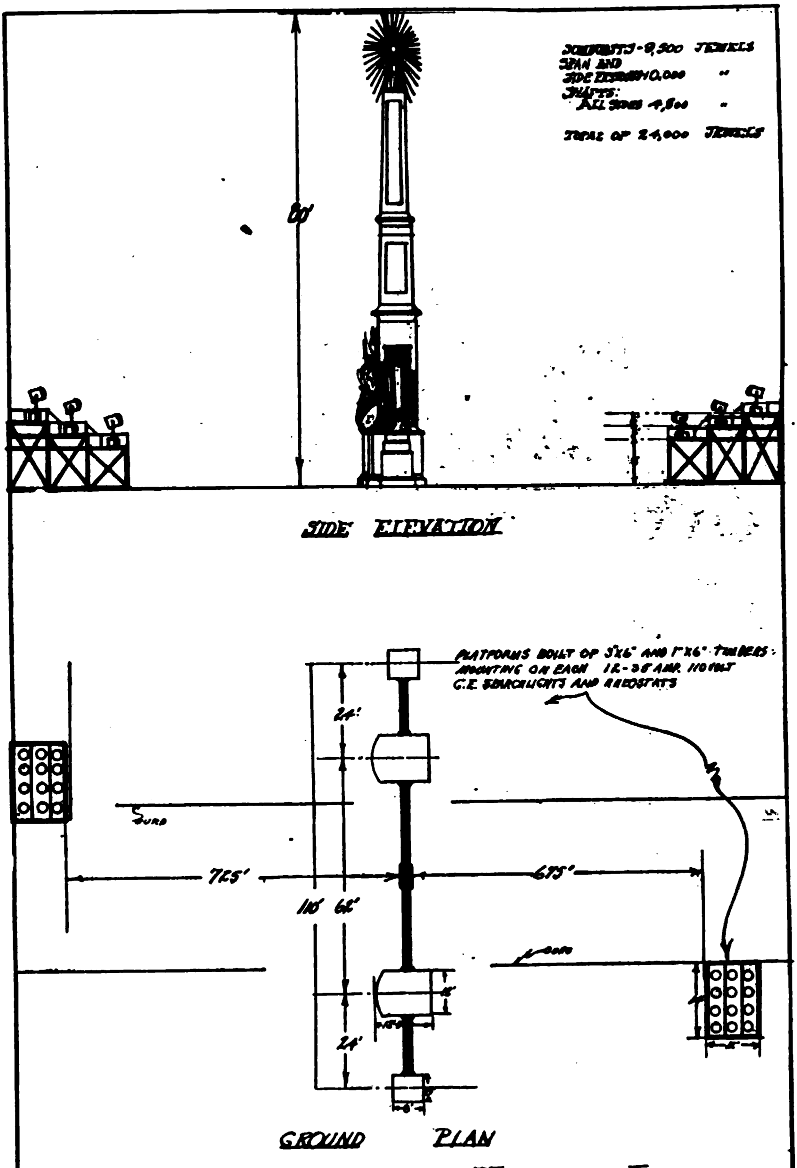
Manuscript of this report was received April second.

tures, of pageants and displays, of flags and festivals, is once more open. The 1917 report of your Committee gives the information required preliminary to the launching of active efforts in this field. References to the more recently developed types of flood lighting projectors are included in the 1919 report of the Sub-Committee on Commercial Aspects of Lamp Equipment.

The outdoor lighting load is desirable in itself as a revenue

JEWELED PORTAL FOR THE VICTORIOUS ARMY, ERECTED IN CONNECTION WITH THE CELEBRATION TO THE HOME-COMING TROOPS

producer. It has an equal value in focusing attention on the subject of lighting and keeping it alive in the minds of the people. The extension of outdoor lighting will be reflected indirectly in higher standards of intensity in all commercial lighting installations and will even affect the use of electricity for illumination in homes and factories. Particularly at this time do brilliant displays on every hand promote confidence, optimism and a revival of trade. In singling out for attention by means of flood-lighting the structures of greatest architectural merit, monuments and objects of art, an important educational contribution is made by promoting idealism and appreciation of the esthetic.



THE JEWELED PORTAL FOR THE VICTORIOUS ARMY

60TH STREET & 5TH AVENUE NEW YORK CITY

Our quickened sense of responsibility in the things which make for the public welfare should lead us to assist in building a vigorous Americanism by promoting the floodlighting of the American flag, so that every night it may be forced on the attention of millions, etherealized in its radiance, a compelling symbol of freedom and national unity.

Throughout the land festivals of victory and peace are being celebrated. In every pageant, arch of triumph, court of peace or lane of honor, light should be the outstanding feature, for no other thing is so symbolic of the triumph of liberty, of peace and progress.

Your Committee feels that these are the immediate opportunities and responsibilities and that they may be made to assist directly in the larger development of the outdoor lighting field.

Respectfully submitted,

H H Magdsick, *Vice-Chairman*
N R Birge
D K Chadbourne
C A B Halvorson
H W Korhammer
W H Marthai
W Reed
Elliott Reid
William A Root
J L Stair
C J Van Gieson

The Chairman: The paper is now open for discussion. Is Mr. Richards here?

W. E. Richards, Toledo, Ohio: So much has been said on this subject that I do not feel I can add anything of interest at this time. Possibly I might express the thought that the central stations by some means should do more publicity work along these lines. There is no better way of beautifying the streets or boulevards than by an intelligent treatment of lighting. In a way it stimulates real estate values, bringing out the characteristics of the locality, besides being good business, and, as the report says, keeping the electric light before the public.

It is well to keep in our display room types of outdoor illuminating units, ornamental posts, and the various types of fixtures, all of which will attract a great deal of attention, particularly among real estate men. This class of work seems to put the finishing touches on many small courts, parks, bridges, and so forth, and is necessary if growth of values is expected. Now that the war is over and the curtailment of outdoor lighting has ceased, it is expected that a very rapid growth in this class of work will materialize.

WALTER D'ARCY RYAN, Schenectady, N. Y.: Mr. Chairman and gentlemen: Floodlighting of large exterior surfaces had its inception in the lighting of the Singer Building in New York; followed some years later by the lighting of the Hudson Fulton Celebration, the illumination of Niagara Falls, the Buffalo General Electric Company's building and similar installations. The installation of the greatest magnitude of both arc and incandescent searchlights and floodlights was the Panama-Pacific International Exposition. Since that time lighting of this kind has become quite general for pageantry, protection, utilitarian and other purposes. Up until recently the maximum beam candle-power of the so-called incandescent floodlight was approximately 200,000 candles distributed over a fairly wide field. We have recently perfected a real incandescent searchlight giving, with an 18-inch parabolic mirror, between seven and eight million candlepower beam, with approximately three degrees divergence. This same lamp in a 30-inch mirror gives between twelve and fifteen million candles; so that we now have an incandescent searchlight equal to the standard 18-inch arc searchlight. This can be used for long range work where you wish to pick up an object say a mile away or where you want to make a relatively small intense spot at short range.

A recent application of arc searchlights was the Jeweled Portal for the Victorious Army, erected on Fifth Avenue in New York and the Altar of Jewels in Grant Park, Chicago. Thirty thousand jewels from the Tower of Jewels, San Francisco, were used on each of these decorations. The New York arch was lighted with twenty-four 18-inch searchlights and the Chicago decoration was lighted with four 60-inch open type army searchlights and one 36-inch plain carbon drum type searchlight, and a fan as a background, similar to the scintillator used at the Panama-Pacific International Exposition, was produced by the use of one 30-inch and six 18-inch arc searchlights, equipped with suitable color screens. The accompanying photographs illustrate the two decorations mentioned.

(Mr. Ryan then presented several lantern slides showing the jeweled arch.)

THE CHAIRMAN: Is there any further discussion?

MR. MAGDSICK: Mr. Chairman, I think there is nothing further to bring before the meeting, except possibly to point out to those who may not be familiar with the fact that outdoor lighting equipments, including flood lighting projectors of various manufacture, are shown in Room E of the exhibit of the Lamp Committee.

THE CHAIRMAN: We will now have the report of the Committee on Electrical Advertising, Mr. E. A. Mills of the New York Edison Company, Chairman.

REPORT OF COMMITTEE ON ELECTRICAL ADVERTISING

In considering electrical advertising your Committee finds that the paramount feature of the situation at the present time in this field, as in all others, is that the war is over. With the armistice in effect and the signature of peace terms a possibility within the next few weeks, electrical advertising appears to be standing on the threshold of a period of prosperity, unprecedented in its history. There are two fields for the extension of electrical advertising which present themselves at the present time:

1. Old signs, darkened by the edict of the Fuel Administration and still hanging inoperative in front of their owners' establishments.
2. New signs, or more properly, new sign prospects.

In considering the first field, it should be the primary effort of the central station and others engaged in selling electrical advertising to see to it that these old signs resume their operation. It is found, in the opinion of your Committee, that mere neglect is at the bottom of the failure of sign owners to renew operation of the sign. The sign serves its function in the daytime, if it is the right kind of a sign, and during the months of war its owner became accustomed to getting along without making use of it at night. Inertia keeps him in the same path and there he will remain until sufficient impetus is given to push him back to his ante-bellum condition.

In going after old business, your Committee believes it to be the duty of every central station and every other agency dealing in electrical advertising to encourage the sign owners to brighten up their old signs, install new lamps, and take such measures generally as will add to the appearance of their signs. An unattractive sign, your Committee thinks, will do more harm than good, and will in no way tend to popularize electrical advertising.

With regard to new business, indications seem to point to a prosperous post-bellum period when the various problems of reconstruction and reorganization have been solved. Reports indicate that the problems are being solved, and rapidly, and

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Manuscript of this report was received April ninth.

that this new business boom is about to begin. With this in view, distributors of electrical advertising should make every effort to see every prospect, and your Committee feels safe in saying that the number of prospects is greater today than it ever has been and that it is being added to daily. In the list of prospects are included small merchants, who, up to the present time, have felt no need of electrical advertising. Sales to this class are exceeding all records, and larger firms are also making notable extensions in electric signs by adding new and larger ones. In connection with this new business it is interesting to note the part which electrical advertising has played and is playing in reconstruction. In a letter recently sent out to advertising managers throughout the United States, Mr. Roger W. Babson, Director General of the United States Department of Labor, Information and Education Service, says:

"To overcome the present inertia on the part of the buying public, more advertising must be done by merchants as well as manufacturers. . . . The public has more money than it ever had before, but it is hesitant about spending it. Such a state of mind can be overcome and quickly and surely by advertising. . . . Only by more advertising through the newspapers, magazines and outdoor signs, etc., can unemployment be prevented. Advertising attracts the attention of the buying public."

Your Committee believes the point made by Mr. Babson is well taken and that through increased business, through electrical advertising and by other means, merchants can best serve not only themselves, but their fellowman, and particularly the returning soldier in need of employment.

There is one field for electrical advertising which former reports of the Committee on Electrical Advertising have not considered. That is the factory field, which as yet has hardly been scratched. There has been found to be a growing tendency among industrial concerns to advertise by use of signs. This is not strange, since in the majority of cases one of the concern's best advertisements is its plant, and there are thousands of factories in the United States today unidentified for the traveler or the casual passerby. A gleaming electric sign on these factories would be a potent advertising factor. One large sign company during the past few weeks has contracted to supply factory signs totalling more than 100,000 lamps.

Your Committee would recall the recommendations of the Committee of 1917, regarding use of electrical advertising by central stations, and takes the liberty of quoting from that report:

"It is a fact that a number of central stations do not have signs of their own. How can you expect a merchant to become interested in this form of advertising if the central station which is pushing its sale and profiting by it . . . does not make use of it?"

The experiences of one large company which operates a successful sign department would indicate that electrical advertising by the central station itself actually does pay big dividends. This executive is authority for the statement that a number of orders for electrical advertising had been obtained because prospects while motoring at night had seen and been impressed by the signs maintained by the company on its own substations.

Your Committee also wishes to emphasize the point that it is desirable to sell "electrical advertising" rather than "'electric signs." The selling of electrical advertising seems to the Committee to be a field by itself and as such worthy of the best efforts of the central station's sales organization. It seems probable that the fact that some central stations have had unproductive experiences with the sign business is due largely to the fact that sufficient thought, time and talent have not been devoted to its possibilities.

In the opinion of the Committee the electrical advertising field offers the central station an opportunity to recoup largely the losses due to the present high costs of labor and equipment. Signs require no new installations; their load factor is high; their construction is fixed; and they offer the central station a larger return on the investment than probably any other activity in which it can engage.

Your Committee highly endorses the reports of previous committees regarding censorship of signs, attractiveness, and so on.

Recapitulation

It is the opinion of the Committee that no previous period has been so full of opportunity for electrical advertising as is the present; that the prospects for the coming year are more bright, due to the conditions cited; and that with sufficient effort and concentration on the part of distributors of electrical advertising, this year will see the beginning of a period of many years of prosperous endeavor.

Respectfully submitted,

E A Mills, *Chairman*
H I Markham, *Vice-Chairman*
R P Burrows
L R Crawford
C A Dean
C J Eaton
R E Harrington
E R Kelsey
W H McBride
W H McIntyre
J C McQuiston
Earle L Milliken
F H Murphy
L H Newbert
E S Pelling
Elliott Reid
W R Sammons

The Chairman: The paper is now open for discussion. Is Mr. Harrington here?

R. E. Harrington, Harrison, N. J.: I do not believe that I have a great deal to add to this report, but I would like to call attention especially to the last paragraph on page 189, as I have felt for some time that the field for electric signs for manufacturing plants has hardly been touched, and the possibilities are enormous. Invariably, signs for industrial plants are large signs, and in addition to offering an excellent advertising medium for the manufacturer, they make a good load for the central station.

In selling signs it is essential that the salesmen place the major emphasis on the advertising value derived from the use of a well-appearing, well-designed sign.

G. H. Stickney, Harrison, N. J.: From some study of the prospects of lighting along interurban highways, it appears that one of the most difficult problems is due to the heavy investment required for pole lines, in proportion to the prospective load. To encourage such extensions, therefore, it is desirable to find additional applications of electricity to build up the load. Electric signs have been suggested in this connection, and it appears to me that signs along the highway might not only help out such extensions, but also prove profitable sign lighting business.

THE CHAIRMAN: Any further discussion?

MR. MILLS: I want to thank Mr. Stickney for his suggestion, and I will be very pleased to see that that is referred to the succeeding Committee for consideration.

It might be of interest to know that our company has inaugurated a system of inspection of electric signs. It is rather a difficult thing to get a man to devote his nights entirely to this work, but we have a force that makes a specialty of this canvassing, both during the day and at night.

There are certain defects in signs that can be determined during the day, namely painting and so forth, where a sign needs painting, which is not as apparent at night; but there are certain other defects that can be determined only at night, when the sign is lighted, such as lamps out. As the inspector goes around, he makes out a card report on each one of these, which report is handed into the office; a general form letter is then sent to the customer, calling his attention either to the fact that the sign needs repainting or that it needs relamping; the results have been very, very favorable.

A. J. GRANT, New York City: In connection with the remarks that have been made regarding factory signs, I had a very interesting talk this last week, with a manufacturer located in New York City, who was making an investment, exclusive of steel construction, of $18,000 or $20,000 in his electric sign. I remarked that he had very little circulation, and he stated that he had the Twentieth Century in the afternoon and two extra fare trains which passed his sign every evening, and if the trains were on time the sign was lighted only fifty minutes. He felt that the quality and extent of the circulation as represented by the type of men traveling on those trains were such that a sign of that quality locating his plant was a well-worth-while investment. Figuring the life of the frame as ten years and the sign as five years, and spreading his investment over that time, he felt he was getting a spectacular, efficient and economical form of advertising.

THE CHAIRMAN: We will now have the report of the Committee on Store Lighting, Mr. A. L. Powell of the Edison Lamp Works, Harrison, N. J., Vice-Chairman.

REPORT OF COMMITTEE ON STORE LIGHTING

Due to circumstances over which the Committee had no control, it was impossible to reorganize and build up the personnel which had been sadly depleted during the past two years. These same causes prevent the submission of a report other than a brief outline of the present state of the art and a proposal for future consideration.

Introductory

The question of store lighting is at the present time of much importance to central station interests. It is the field of lighting where the largest gains can be made quickly and easily. The merchant responds promptly to an activity which he realizes will increase his business. An increase in the standard of store lighting will influence other classes of lighting.

On account of the coal shortage during the war period it was necessary, as we all know, to curtail lighting in certain fields. It was quite natural that commercial or merchandising institutions should be the first and possibly the hardest hit on account of both economic and psychologic reasons. Window lighting in particular was one of the first to feel the effect of the ban. Merchants were urged to cut down, as far as practicable, on interior lighting, and as a class they cheerfully and patriotically complied with the requests or mandates of the Fuel Administration.

Curtailment of lighting was a serious proposition with the merchant, for he, more than any other class of individual, realized the relation between brilliant illumination and sales. He had studied the psychology of lighting and knew the results obtained from its liberal use. There is no question that sales suffered somewhat during the period of dark windows and rather dim interiors.

The cessation of the war made unnecessary the far more stringent regulations as to store lighting, which were under consideration. The Fuel Administration felt that it was absolutely necessary to cut to the bone wherever possible and the level of

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Manuscript of this report was received April second.

store illumination was to be placed at a minimum value consistent with ability to do business in any fashion.

This limitation of store illumination may have two effects. It is quite possible that the reaction from the low levels necessary during the war will bring the standards of store illumination even higher than previously, without special effort on the part of anyone.

On the other hand, there will be cases where cost alone is considered and the situation will not be properly evaluated. Some merchants will believe that they are operating satisfactorily with much less light and will continue this practice. Those stores which sold necessities maintained their business even during the period of low intensity lighting. Competition with better lighted stores will now automatically, it is hoped, restore the situation to normal.

It is the opinion of the Committee, however, that vigorous action on the part of the central station is desirable to take advantage of the present opportunities along this line. Campaigns of an educational nature, pointing out the relation between lighting and sales, should be instituted. These can be carried on in the trade and popular press and should be vigorously supplemented by local effort. It may even be desirable to put into force local store lighting campaigns, such as outlined later in this report.

Pre-war standards of store lighting are not to be our goal. They have been fairly satisfactory, but it is the opinion of many that even these were too low. For example, in a paper by Mr. P. S. Millar on Lighting Curtailment, which appears in Volume 13 of the the Illuminating Engineering Society's Transactions, is found the following statement:

"Within the past two weeks the author has requested a number of the members of the Society to express their views as to the adequacies of standards of lighting practice. The consensus of opinion secured showed that in line with the present ideas of desirable practice as compared with practice just before the war in commercial lighting (which includes offices, stores, etc.), there should be an increase of 40 per cent."

If the store lighting load could be increased this amount, certainly a very valuable addition to revenue would be secured.

This should be easy of accomplishment, for the merchant will naturally have to make his store bright and attractive during the keen competition of the reconstruction period through which we are passing.

Divisions of Subject

There are three classes of stores, viz: large dry goods and department stores, distinctive shops and ordinary small stores.

The large dry goods and department stores are comparatively few in number and of sufficient size so that when a change in lighting is contemplated, the subject is investigated thoroughly. The management can afford to take the time for this and, if necessary, call in a consulting engineer. Moreover, they are wide awake to the necessities for adequate illumination and will, no doubt, maintain the proper standard of lighting. Only on rare occasions would the central station solicitor be involved. It is true that if the lighting salesman were on his job he would be thoroughly posted on the latest practice in department store lighting. If called into consultation, he should be the best informed man at the conference and thus establish a prestige which would prove of much value at a later date. The technical literature, N. E. L. A. Salesman's Handbook, and publications of manufacturers cover the subject in a comprehensive manner and a discussion of this class of lighting is out of the province of this report.

Originality is the keynote of the second group of stores, namely, the distinctive shop. Any standardized scheme of lighting is utterly inappropriate. These stores should never be handled by the campaign method, although they are naturally reached by the general agitation for better store illumination. When approaching these prospects the central station man should call his artistic ability into play and make suggestions for some novel method of illuminating the shop, which blends with the desired decorative treatment. These shops are usually willing to spend far more for lighting than others. Frequently light absorbing fixtures are employed to get the desired effect, yet looking at the subject broadly, this is not bad economy.

The ordinary small store is the one of vital interest to the central station. These exist in quantity in every community.

Individually, they are not important enough to give very serious consideration to the best methods of illumination, but collectively, they form a big proposition. A standardized scheme of lighting with possibly a slight variation as to type of equipment is logical. It is this class of lighting to which the attention of member companies is especially directed.

Proposed Campaign

It is the opinion of the Committee that the industry requires some practical campaign methods which can be put into operation by both the large and small central stations with the least amount of executive supervision.

The Committee has not had the opportunity of getting together and discussing this subject from all possible angles, neither has it had a sufficiently large personnel to obtain the necessary variation of viewpoints. As a result, the proposal can be presented only in vague outline, but the Committee would be very glad to go into the matter in detail with those central stations interested and render every possible assistance.

The first step in the campaign is the selection of the complete fixture which will be featured. It is most desirable to confine the selling effort to a minimum number of styles. As pointed out, there is no real need in the small store for individual treatment. With only one or two fixtures to show, the purchaser is not confused and the salesman can become thoroughly familiar with all the essential features. Moreover, if fixtures are purchased in quantity, low prices should result, even in days of relatively high labor and material charges.

It is to the interest of the central station to see that the merchant or consumer gets at a reasonable price an effective, well-designed lighting unit suitable for his conditions. At the present time it is somewhat difficult to obtain such a unit from local stocks. In other words, there is a lack of standardization of commercial lighting fixtures, particularly applicable to the small store. It is often necessary to secure the glassware from one concern and the fixture or metal portion from another.

It would be necessary to hold a conference between representatives of the central station and those manufacturers of lighting equipment in a position to furnish in large quantities moderate-priced complete fixtures suitable for store lighting. Sketches or designs of suitable units should be available and these analyzed as to efficiency of light distribution, general appearance, workmanship, design, cost, etc. A very important point to consider in connection with such a commercial fixture is the ease of shipment, stocking, etc. It is most desirable that the complete units be packed in compact containers.

One or more types should be chosen which combine the desirable features of the different designs. Standard specifications would then be drawn up of the complete fixtures and turned over to the manufacturer for production.

The Committee feels that it could be particularly helpful to the smaller central stations which do not employ lighting specialists. It would be very glad to go over the proposed fixtures and make such constructive suggestions as may seem desirable. A discussion of the general question of cooperation of the various specialized committees with the individual central station might bring forth some valuable suggestions as to ways in which the work of the Lighting Sales Bureau could be made much more effective. The above hint indicates one of the possibilities along this line.

Evidently the next move on the part of the local company is to call a meeting of the contractors and outline the campaign. After consultation the central station representatives will decide on the price they will pay for wiring per outlet, terms of payment, method of financing, etc. An estimate would then be made of the sales possibilities and a sufficient stock of standard units ordered so that when the campaign is launched there will be no delay in installation with its attendant annoyance.

A few features of the campaign could well be:

Local advertising in daily newspapers with copy and electrotypes furnished by the manufacturers or main office.

Editorial or news stories on the value of proper lighting, copy furnished by headquarters.

Talks or lantern slide lecturers before local boards of trade or merchants' associations on "Modern Store Lighting," text and slides from Lecture Bureau service.

Booklet prepared by the Publications Committee on "Store Lighting" mailed to all prospects.

Neatly mounted photographs of typical store lighting with the standard units, for use by solicitors when calling on prospects.

Summary of certain sections of the *Electrical Salesman's Handbook* to give solicitors talking points on store lighting and ready means of calculating spacing, hanging heights and size of units desirable.

Windows

The general principles of show-window illumination are well understood and no store can be operated successfully under present conditions without good show-window lighting. The campaign will naturally include this phase of store equipment. As with the interior store fixtures, standard window lighting reflectors will be adopted and stocked.

By way of suggestion, it might be possible to make up standard window lighting outfits of metal moulding, having two, three and five sockets per strip of definite length. These could be wired in advance and simply screwed in place, lamps inserted and reflectors attached. This would keep the cost of installation at a minimum.

The advertising and other literature on store illumination would naturally include a section on show windows. In this connection it might be well to point out some of the possibilities of future development in show-window lighting.

The show window is designed primarily to attract the crowd and compel its attention. Startling, novel features are an asset in this respect. Artificial light is one of the best means at the disposal of the display manager to produce the desired effect. The possibilities in the way of colored lighting have not yet been fully appreciated. Most windows are still lighted with approximately the same kind of light that has been in use for many years. The display manager is in reality a miniature stage director, and he has, therefore, something to learn from Belasco, Urban and Rhinehart. These great artists of stage direction do not confine themselves to the unmodified light from the incandescent lamp, but use all colors of the spectrum. They obtain such colors by the use of gelatin screens or superficially colored lamps.

In connection with store window lighting, it is most desirable that a convenient means of modifying the color of light be devised. This can be accomplished quite readily, for in most cases the opening of the reflector can be covered with a gelatin screen or some tinted fabric. The future will no doubt see standard devices for obtaining this modification. For some materials a pinkish tint may be suitable, for others a deep amber, again a light green, and so on. The ingenious display manager can readily determine just what effects he desires. For the pure colors an entire section of a window can be equipped with color screens; if just a slight suggestion of color is desired, two or three of the units can be so fitted, while the others are unmodified. The effects produced by toned lighting are most striking and they can be readily predetermined by the use of an inexpensive color booth.

The tungsten filament gas-filled daylight lamp has become another valuable medium in the hands of the display manager. An installation of these lamps causes the window to be distinctive and stand out prominently. A window so lighted is very striking and the goods are shown in practically their daylight value. It is not expected that this lamp will effectually supersede the regular tungsten lamp for all window lighting, yet there are certain displays which are shown to their best advantage under this kind of light. Under the light of this lamp linens and white goods appear pure white rather than slightly yellow; men's clothing, particularly if blue or black, shows up splendidly, and furs, jewelry, shoes, neckties and the like are wonderfully well displayed. When such displays as those mentioned are set up, these lamps should be installed to obtain the best effect. With colored lighting, it is possible to vary the equipment as occasion demands, avoiding monotony and obtaining the best advertising value.

On the stage there are many points at which lighting units can be located, overhead, below and at the sides. Space in the show window will not permit such latitude. In general, the most useful lights on the stage are those in the border and proscenium strips, which supply diffused light from overhead and in front. It is true that footlights are used a great deal on the stage, but these are employed more as a matter of necessity, and it is realized that they produce reversed shadows or unnatural effects, necessitating special make-up. Footlights are usually out of the question in window illumination, although a very little light from below is sometimes desirable to cut the shadows at the base of the figure and show the footwear to better advantage.

Lighting units should be placed in the upper front part of the window. In order to introduce the certain element of diffusion mentioned above, a number of small lamps are preferable to one large unit giving the same amount of light. There may be exceptions to this rule.

The object of a show window is to attract attention by a striking appearance. It is a well-known fact that very startling effects can be produced by varying the direction of light. These can be readily investigated with the assistance of a small shadow box. The display man spends hours arranging an artistic window. He should devote a part of that time to the adjustment of the lighting. All displays should not be lighted in the same manner, and the display manager should experiment a little. Some exhibits may require the predominating light coming from one direction, others from another angle. This can be done by varying the size of lamps used. For example, those at one end of the window may be 100 watt lamps, while those at the other end are, say 25 watt. Great possibilities along this line present themselves.

Some of the windows of recent construction have a feature which is quite desirable from the lighting standpoint. They employ a light-colored background with mat or dull finish. The light color of the background makes the window appear especially prominent, while the dull surface prevents annoying reflections of the lamps. On the stage, one very seldom sees a scene painted a dark, dingy brown or gray, which appear dull no matter how much light is supplied. If the show window is to have a bright appearance, dark wood backgrounds should not be used.

Conclusion

It is realized that the proposed campaign is outlined in rather vague form, as the Committee has not had the opportunity of discussing the details. It would seem desirable to plan a campaign for either the spring or the fall, and it is believed that enough impetus would be gained during the period when it was active to carry the sales through the rest of the year. By a simple change in design of fixture and glassware, the campaign could be promoted from year to year with modifications, if experience showed these to be desirable.

Respectfully submitted,

A L Powell, Vice-Chairman
C T Barnes
E Mandeville
H T Spaulding

The Chairman: Mr. Macbeth?

Norman Macbeth, New York City: Mr. Chairmen and gentlemen, recent experience has led me to the conclusion that our present store lighting is on the same basis as regards low intensities as our present street lighting. A large part of the store lighting is in that condition referred to by the Committee that intensities could be increased 40 per cent over pre-war-time usage. I believe our investigations have shown that if you want to see, as the customer does, strange fabrics, you need anywhere from five to twenty times the present store lighting intensities.

In large stores this means local lighting of high intensity over a limited area. Glare spot-lighting in stores may have the same effect as in streets. In some streets the kind of lamp equipment and its location tend to prevent people from seeing clearly.

Many here have ridden bicycles in the country on a moonlight night. You can recall how easy it was to see the road and large obstructions, but when you reached the town or city streets with the addition of the street lighting, clear vision was not helped but was hindered.

I would like to see the store lighting men do what has been reported from Chicago in industrial lighting:—lighting for profit, lighting for sales. If you cannot do it otherwise, slip up on your calculations.

I recall a case twelve years ago where I slipped up on a window job, instead of giving 5 watts per square foot, as advised by the lamp manufacturer's engineer, I gave 25, with satisfactory results. I found that particular store had more calls for goods shown in its windows than it had from its newspaper advertising. Its total cost of lighting the window was $500 a year, and the newspaper advertising $10,000. The window lighting cost was 5 per cent of the advertising appropriation, and was equaling it in returns. I called attention to the reflection on the plate glass and the apparent darkness of the window in the daytime, and it was not long before all their window lighting was put on at eight o'clock in the morning, and left on until eleven at night.

Find out what store lighting is worth to the man who is going to use it, and you won't have much trouble in having him increase his lighting intensities. I was talking to a department store man this week who told me $10,000 worth of one kind of merchandise had moved over a counter in one day last week. The counter was not extensive, and customers were at least two deep practically all day. The general illumination was of low intensity, which undoubtedly retarded the clerks in noting prices and in writing sales checks, as well as slowing down the customers in making their selections. If there had been more light, could the store have sold $11,000 worth? How many kilowatt-hours would be used for adequate lighting and what relation would even extravagant intensities bear in cost to the additional sales of $1,000 for one day?

On the question of window lighting, I noted an item in a paper the other day that Woolworth has never done any newspaper advertising. We have had recent stories, also, of the money that the Woolworth Stores have made, and the Woolworth Stores depend on window display and fairly high intensity store lighting. I recall in a visit to a New York State city a few years ago, talking to a central station manager who was bewailing his fate that a Woolworth store had opened in his town. The Woolworth store was so bright in comparison that other consumers were kicking that their voltage must be off, "the light was not any good." An excellent opportunity was lost to use the Woolworth example to raise the illumination level in the stores in that city.

I thoroughly endorse the recommendation of the Committee on the use of colored light in windows. Color in fabrics has a very considerable attraction value to the people on the street.

All the color need not be in the fabric. You can actually have a window in white goods, and with color in light produce a variety of color effects. To make a show window different will attract attention. The Regal Shoe Company used Cooper-Hewitt lamps for that purpose many years ago, when that lamp was new and strange to the average citizen.

I believe the use of color screens presents much greater possibilities than the blue glass bulb lamp for window work. This lamp, which is technically known as the Mazda C2, has been handicapped by the loose designation of "daylight lamp." I have known of purchasers of this lamp expecting photographic results equal to natural daylight exposures, and store managements have in many instances attempted to use them for color matching and color selection work, knowing that daylight would do the work. Daylight enables you to see where otherwise it would be dark. So will the C lamp and also the C2, but when it comes to color matching or exacting color work of any kind, a white light is necessary. It is like catching a train. You can be ten seconds late and miss the train; you are no further on your journey at ten seconds late than ten minutes or an hour late. Unless your light color is absolutely right and within the natural daylight range, it will not be satisfactory for color work. Any lamp with a tungsten filament at present efficiencies used in a "daylight lamp" with colored glass bulb or filter will have an absorption of about 80 per cent to approximate daylight in color.

H. C. Sterling, Atlantic City, N. J.: Several years ago, it was my pleasure to attend a meeting of the Illuminating Engineering Society. It was held in a fine hotel overlooking one of nature's wonders, and the Nation's greatest waste of natural resources, Niagara Falls.

For several sessions, I listened to the high brows, most of whom seemed to be batting close to 1000 in their discussions. But having been educated myself in the school of hard knocks, they seemed to bat largely over my head, using as their material, lumens, foot candles, plans of illumination, etc. Finally, a paper was presented on the subject of the lighting of small stores, which was in terms of English that I could fully comprehend. This paper was prepared by Mr. Powell, who is Chairman of the Committee which prepared the report we have just heard.

It is not my intention to criticize this report, but rather to comment on some of the points brought out. I fully agree that the question of store lighting is of great importance now, but think it is equally important at all times, for, as brought out in the report, fairly large gains in revenue can be more quickly realized from store lighting than from residence and some other classes of lighting.

The influence of a good installation in some particular store is seen in improved lighting standards in other stores in its vicinity. I have noted this many times in Atlantic City, and I feel that the general plane of illumination has been increased 100 per cent in the past four years in this city, largely due to this influence.

I believe that the net result of the lightless nights will prove to have been beneficial to the lighting industry. The average business man never fully realized what an asset to business his lighting was until it was taken from him.

I don't know how others fared, but, as hard as it was to do so, we fairly had to fight and threaten our consumers to carry out the orders of the Fuel Administration. It was then that the merchant began to realize that there was a direct relation between his well-lighted store and his sales.

The after effect of limiting the amount of light during the coal shortage was not bad. In fact with us, the moment the ban was lifted our consumers all came back with full load, and many with increased units.

As an interesting side light on the value of electricity for sign lighting by some of the leading advertisers of this country, I quote as follows from an article by R. E. Swift of our Commercial Department in the February issue of the *American Gas and Electric Bulletin,* on "The Value of an Electric Sign in Daylight Hours."

"Of untold value to the advertiser at night, what then is its daylight value? I, personally, have always been willing to concede at least 20 per cent as its daylight worth, and have always used this in trying to sell signs. But this belief was due for a bad bump and a sad awakening when the 'Lightless Nights' period took its place in the line-up with the many other evils put upon us by the Hun. I think the central stations should claim the right to have one representative at the Peace Table in France just to "Swat the Germans" an extra biff for what they did to our revenue. But this is another story as our old friend, R. Kipling, tells us, so let's go back to the text once more, namely: 'Of what value is an electric sign in the daytime?'

"Not one penny's worth, say the leading advertisers of this country; advertisers of national repute, men who spend millions in electrical advertising each year, men who believe in electric signs with all their might as a medium of selling their goods above all other ways, concerns which pay exorbitant salaries to efficiency experts yearly in order to save every penny, yet willingly pay out millions to tell their tale electrically. These are the men who know values and these men jolted my little theory of a 20 per cent daytime value when they one and all came out flat-footed and refused to pay one cent to the sign companies which maintain the various signs on a yearly contract basis, except for the one night each week the signs were allowed to be lighted. In vain did these sign companies talk daytime value, for they talked to deaf ears. Lighted they were worth thousands of dollars, unlighted not one red cent."

So I think that the average live merchant, like the big advertisers, is today more keenly aware of the value of good lighting than he was before the restricted period. I agree that we should take advantage of present opportunities and conduct active campaigns of education to acquaint all merchants with the fact that there is a direct relation between good lighting and sales. I also agree that pre-war standards should not be considered high enough and that we should try to induce merchants to install units which will produce greater results.

It is not usually difficult to induce the larger stores and distinctive shops to install somewhere near the type and size of units they should use, but there are 200 small shops and stores of all sorts and kinds to one large one.

First cost is a big factor with these, and too often here in Atlantic City as elsewhere, glare can be produced for less than illumination and so it's glare for them. However, in the past year or two several inexpensive semi-indirect fixtures have been produced which are beginning to find their way into these many small stores, and I can see a decided tendency toward better results and increased revenue from this class of business.

I think too little attention is given the small stores by many central stations.

My experience has shown that first cost is the big item that keeps many small shops from using electric light. About three years ago, we tried out a plan of loaning a fixture, a one-light pendant on a chain with a 12-inch ball, where the shop would agree to use a 200-watt lamp, providing it would have the wiring done. We loaned about 1,000 of them, and the plan proved very popular, resulting in the wiring of many small stores that had previously used gas exclusively. On the whole I am confident that this resulted in some good revenue. The conditions of the loan of the fixture were, however, in some instances abused. After a man had received a bill or two, which perhaps seemed a little too large for him, he would substitute a 40 or 60-watt lamp, with the result that his lighting was not satisfactory. As a matter of fact, I have noticed many instances where a good type of fixture was installed with proper size lamp, and later a smaller lamp substituted, resulting as stated above in poor illumination.

This is a difficult problem to solve; the stores will complain of the poor light, and you can only call their attention to the reason, and try to induce them to use the proper lamp.

Plans for reaching out for this small store lighting must be worked out by central stations along lines most suitable to their locality and conditions. The suggestions offered by the Committee to accomplish results are good, and worthy of careful consideration by those who plan to go after this class of quick revenue producers.

THE CHAIRMAN: Mr. Scherck, will you discuss this report?

L. H. SCHERCK, Poughkeepsie, N. Y.: On this subject of lighting, it seems to me that we might well think of the answer of the old painter to the young one, who when asked "What do you mix your paints with?" replied "With brains, sir."

In looking around the room one probably finds some evidence right here, in the lack of attendance for an important paper like this one, that this probably in some way shows at least that those of us in the industry do not yet fully realize the importance of the proper consideration being given to the subject of lighting.

At one time all of us were very anxious to keep down the lighting peak. We had the old form of arc lamps and lamps of relatively low efficiency, and we were all fearful of the lighting peak, lest with creation of a large lighting peak it would be impossible for us to fill up the valley with proper loads.

Now, what has happened today in a number of situations is that the power peak either has become or is likely to become the peak of the station. In other words, the lighting peak, which we have been afraid of, has in many instances ceased to be the peak, and the valley which we were so anxious to fill up with power has become the period of maximum load. In a number of situations where this has not as yet happened, we can view the possibility of its coming about when we consider the large demands which industry is making on the central station, including the tendency of street railway companies, wherever possible, to purchase power from central stations. So I say again, we have to look anew at the lighting business and realize its new importance when we read or write the tendency of the times.

Those of us in the business should take a greater interest in our lighting load than we have done. When I say this, I do not speak simply to hear myself talk. I have had the opportunity of observing central station conditions throughout a large section of the United States, and if there is one thing that has impressed itself upon me it is this, that we have not given the consideration to our lighting load which it deserves. Originally, of course, our main business was the question of lighting. Then we felt the necessity of developing the power load, and we went about this matter very seriously. We employed high grade talent, analyzed conditions properly and developed the power business to its present high state, but in doing this, and probably in being so taken up with the magnitude of the power business, we somehow did not give proper attention to the development of the lighting field. Now, there is no magical way of developing any side of our business. I do not know or think anyone knows of any one rule that is going to be the means of developing the lighting business. We must first consider our conditions, realizing the importance of the matter under consideration. We must provide for the proper analysis of the lighting field just as we did of the power field, and secure the proper appropriation for such analysis and the proper sales force, so that the analysis made may be put to a practical use. If we do this, we will secure the proper amount of business from lighting. We should not send men out to represent us who are not qualified to do so. You cannot get a boy, give him a correspondence course in illumination and send him out to solve fairly big problems. Some of us tried that many years ago in power and we know that it did not work out. The power business did not develop until we educated men and impressed upon them the importance of the work they were doing and the importance of knowing probably more about the operation of the prospect's plant than he did. We all know that we did not make any great progress in securing large power business until we did this. I see here some men who have done a great deal of work. I am looking right now into the development of the power field, and recall about twenty years ago one man, now prominent, who is in this room, who discussed with me the possibility of electric power—if we simply understood the power game and knew something about the prospect's needs. Now, we must proceed in a similar way in the matter of lighting. We must reeducate our executives to the importance of it, and must educate ourselves. We must understand that we must develop men into high grade men who will handle this thing for us, and must pay these men, when they deserve it, a decent wage. We must spend a proper amount of money for informing the public on lighting matters, both by advertisements and by personal visits of our representatives. Providing this matter is handled intelligently, I believe the expenditure would be small compared with the income to be derived.

When I speak of return, I do not mean "gross return," because after all it is the net return which counts. As I have said before, in many situations the power load has already become the peak. In many more, there is a tendency for it to become the peak, and we all know that the power business is growing by leaps and bounds. Therefore, do not let us be neglectful of our lighting business, because as we build up our power load there is a special necessity that we give at the same time due consideration to the lighting business.

THE CHAIRMAN: Mr. Israel.

JOSEPH D. ISRAEL, Philadelphia: I have nothing to add to the discussion of these subjects other than to refer to the paper which was read regarding store lighting and window lighting. I think there is no question in the mind of any merchant that his window is one of his best advertisements. Anything that would tend to help us to give versatility to the forms of window lighting would, no doubt, be of great benefit, not only to the central station companies, but to our customers, whom we all endeavor to serve at all times.

In connection with this matter, I heard discussion this morning from a man who is well posted along these lines, particularly from the advertising and publicity end. He was looking at the exhibit of the Lighting Committee. He thought that the suggestion should be made to us, of the lighting sections of our companies, to consider some form of demonstration along the lines of the exhibit that we have here, so that we could show our customers just what could be effected by these various forms of lighting methods.

We might, if the conditions permitted, have an exhibit of some limited extent, probably not as large as the exhibit here, but this reproduced in miniature. If we had such an exhibit, with the conveniences of showing these various types of lighting, covering the color schemes in the windows, and so forth, it would materially aid us in our business, and be of great benefit to our customers. (Applause.)

THE CHAIRMAN: Mr. Peck.

HENRY W. PECK, Schenectady, N. Y.: Mr. Chairman, there are just two points that occurred to me in connection with this paper that might be worth mentioning. One is that we should try to increase the proportion of distinctive stores to those characterized in the paper as the ordinary run of small stores. With the efficient, modern lamp we do not have to pick out the most efficient fixture in the world in order to satisfy our customer. I believe we can well afford to secure somebody or train somebody to keep in touch with the fixture product, so as to give a distinctive layout for these stores different from the one next door or the one on the next block. Let them be the same efficiency or not, it is immaterial, and the merchant does not care.

The other point was that I had quite a shock about a year ago to find that an itinerant fixture salesman had struck town and was doing business. I thought that we were fairly wide-awake. He did not go up and down State Street in the bigger stores to market his wares; he would go on the side streets, the outlying districts, and get away with a fixture which was not bad, neither was it very good, except for the fact that he substituted a 200 watt lamp for about a 50 or 100 watt lamp. I found on inquiry that he was not advising our customers to that effect, but I have noticed that these fixtures remain in and the 200 watt lamps remain in. I immediately got after our sales-department and said that I was convinced that we could very easily increase the capacity of the installations in those smaller stores to great advantage to our net, as Mr. Scherck says, and at the same time put in better fixtures than this particular one and more suitable installations for the customers.

I believe we are apt to be a little too conservative as to what we can do with our customers. The general public would not agree to that, but I really think that such is the case and that we can do much more if we go right after it with the courage of our convictions.

Joseph F. Becker, New York City: I was rather—I do not know what to say—amazed, or, rather, stunned, I might say, at Mr. Scherck's remarks regarding the fact that the lighting business had gone to the bow-wows, and that we central station men had neglected that part of our business to such an extent that we would have to get busy again. Probably it is true, as he said, that for a few years past the central station interests have been busy building up that valley load and giving their attention to power and other current-consuming apparatus; but I think it is self-evident to any man or to anyone traveling the streets of our cities that lighting has had the attention of everybody in the industry.

We have had the cooperation of the lamp manufacturing companies. We have had the cooperation, or the assistance, of manufacturers of the unit. We have had this tremendous development of the incandescent lamps and the single unit burner; and I think if you would look into a store today and evidence the lighting and evidence the thought and the time that somebody has given to the installation, you will agree with me that the question of lighting has not all been neglected.

Now, I realize that a whole lot of what Mr. Scherck said is true, that there has been some neglect on the part of the central station men, but what I said also is true, that some other element, some other factor in our business, has taken advantage and developed a very good system of lighting throughout our various cities.

Mr. Scherck: I am wondering if Mr. Becker is thinking in terms of New York, Philadelphia, Boston and Chicago. If he is, I am inclined to agree with him. I was thinking, however, in terms of the United States. I was thinking of a number of small companies. There are several hundred which are members of this organization as against the few larger companies. The best proof of what I have said is for one to go into the medium sized cities—the smaller cities, if you please, as compared with the great metropolis. If you had invested in the public utilities of some of these cities, I am inclined to think that you would agree with me that there is what amounts to great neglect on the part of those in charge of public utilities in the proper development of the lighting field. There are many splendid examples of lighting in the larger cities, and probably the larger cities have done a great deal to develop their lighting business. My plea, however, was to endeavor to awaken the managers of the smaller companies to what they have neglected. My hope was that my words might help them in some way to follow up the splendid lead which has been given by the larger cities in this matter.

Mr. Mills: Mr. Chairman, before discussion on this paper closes, I want to voice my feeling against the statement made by the authority Mr. Sterling quoted regarding the daylight value of the electric sign. I think you will find in the majority of sign ordinances that the electric sign is permitted to project a considerable distance over the sidewalk, so that, even though it is not lighted during the daytime, it still has a great deal of value.

Frank C. Taylor, Rochester, N. Y.: The suggestion of the Committee that the central stations promote a campaign to improve the lighting of small stores is excellent and should be adopted by more of the central stations. There are so many fixtures on the market that the average store owner does not have any idea about the proper type to install. Consequently, the unscrupulous salesman can sell him an inferior fixture, and from this the central stations should, if possible, protect the customer.

Another point that came to my mind is that the majority of us do not realize the advantage of the C-2 lamp or daylight lamp. By selling this lamp we can not only increase the sale of electricity, but also secure satisfied customers.

Department stores, shoe stores, clothing stores of all varieties, jewelry stores in some cases and all stores in which the color of the light is important should use a daylight unit of some kind.

Three years ago, in Rochester, a department store installed daylight fixtures and immediately took the name of the "Day Light Store" as an advertising feature. This was one of the first, and soon three other department stores were obliged to follow this example and put in a type of daylight fixture. The most recent installation within about a month is one in a clothing store, in which 500-watt C-2 lamps in the so-called 4-in-one fixture have been installed. One of these lamps illuminates an area 16 by 18 feet and gives excellent lighting in the store. Another point which a great many lighting salesmen absolutely ignore, partially through ignorance and partially because they do not care to go into it, is the color of the paint used in stores. They put a daylight installation in a store with red, brown or dark colored walls. If daylight is desired, the walls must be painted white or some tint of blue or gray in order that the resultant light, including the light reflected from the walls and ceiling, will be approximately daylight.

W. E. Richards, Toledo, Ohio:* The report of this Committee has spoken the truth—that active work was at a standstill

* Written discussion.

during the past two years. And yet, considering the times and the depleted personnel of the illuminating profession, there has been a remarkable advance in the art, particularly in store lighting. The field is so great and the demand present that great changes are to be expected.

It was not so long ago that our stores were simply a place of exchange. The merchant now has awakened to the fact that to a considerable degree his success depends upon how well he can please the public, and in this the appearance or attractiveness of his place is the greatest factor. No other element is more responsible for the success of the pleasing appearance than his illumination. This fact is not generally understood, probably on account of lack of the proper amount of publicity, which is more responsible for many cases of poor store lighting than any other cause. The merchant is more than willing to be educated, but there is not the proper amount of energy expended by the average central station to supply his needs.

Another phase of this question is that there is a lack of harmony between the architect and the illuminating engineer. A very noticeable case came to my attention recently where there seemed to be no thought of common interests between the two professions. It was an important piece of work and it was hard for the owner to smooth out the difficulties. There seemed to be an absence of that element in both the architect and engineer to appreciate each other's problems.

I wish to convey the thought that there is missionary work to be done by this Committee on the above lines. I think the scope of the Committee should include a study of architectural work so that closer relationship may be established with that profession.

The educational exhibit of store window lighting has proved of such great interest that I would like to suggest that the Committee see to it that similar exhibits are planned for future conventions.

The Chairman: I will ask Mr. Powell to close the discussion before we proceed to the next paper.

Mr. Powell: The Chairman has asked me to refer to the show-window in the lighting exhibit of the Lamp Committee, in which several systems of window lighting are available, and the type of illumination can be changed at will.

One point that came to my mind in the discussion was the remark of Mr. Macbeth in regard to the color matching qualities of mazda C-2 lamps. I find no place in the paper where any claim is made for color matching qualities, merely the statement that "an installation of these lamps causes a window to be distinctive and stand out prominently and the goods are shown practically at daylight values." The Committee members have all realized that no claim should be made of color matching values. (Applause.)

THE CHAIRMAN: Before calling for the next report, I would like to announce that we have another committee report that will be presented tomorrow afternoon in this room by Mr. Durgin; that is, the Industrial Lighting Committee's report. Inasmuch as it comes pretty near the last of the session, we want to give all the publicity possible so that we will have a very good attendance, because it is demonstrated quite elaborately. Mr. Durgin has gone to quite some trouble to prepare it for us, and we hope that we will have a large attendance.

We will now have the report of the Committee on Lighting of Public Buildings, Mr. G. B. Regar of the Philadelphia Electric Company, Chairman.

REPORT OF COMMITTEE ON THE LIGHTING OF PUBLIC BUILDINGS

The function of the Committee on the Lighting of Public Buildings is the study of sales methods and campaigns to illuminate the interior of churches, theatres, armories, schoolhouses, hospitals, libraries, federal and municipal buildings, office buildings, railroad and steamship stations, halls of apartment houses, hotels, clubs, etc.

With the possible exception of churches and school houses, the greater percentage of this class of business is illuminated by electricity, and of these electrically lighted installations, with the exception of perhaps the larger hospitals, office buildings, hotels and clubs, the service is handled by the central stations.

Even this condition varies in the several communities, according to the size of their population, several of our largest central stations handling practically all of this class of business.

Sales campaigns, as generally adopted by central stations, do not apply to public buildings' business, owing to their limited number. In fact, sales methods are largely a question of plan, differing in the practice made necessary by the complexity presenting itself in order to reach the deciding authorities.

The problem presents two factors; first, the addition of new business to the load, and second, the maintaining of efficient connected installations.

In the first instance. the procedure follows the ordinary dictates of commercial sales. The prospective consumer is in a receptive mind. It becomes necessary only to present the well-known advantages of electric lighting, and, in some relatively few cases, the advantages of central station service over isolated plant service. If, however, the advantages of an efficient lighting installation are not presented in a way sufficiently forceful to compel their realization by the consumer, then the central station has failed to carry out the policy of the electric lighting industry "That we sell service." It has further placed the installation in the second class referred to, and has encouraged the possibility of future complaints. It has further made that installation the prey of the salesman selling competitive illumination.

Manuscript for this report was received March twenty-seventh.

As to the second class, a much more complex condition presents itself. The installations are existing facts. Many have been connected for a number of years with no effort having been made to modernize their equipment, and numerous of the new or recently connected installations are inefficient, owing to a lack of knowledge or perhaps effort on the part of architects to harmonize the architectural and lighting effects. This latter condition occurs in the more ornate or larger class of buildings.

With some notable exceptions, the lighting of federal and municipal buildings and of railroad and steamship stations is bad, and of schools, churches, hospitals and libraries poor. An inertia seems to exist, due possibly to the varied interests of the committees or boards having in charge the management of public buildings.

Sales methods or campaigns therefore involve two principles, namely, individual method of approaching the deciding authorities, and a propaganda having for its purpose the acknowledgment of good lighting.

There is a great deal of unfortunate misunderstanding as to the commercial purpose and practical value of the science of illuminating engineering to the lighting industries. Its laws and principles have been discussed and analyzed through years of evolution, its practices have been defined, its ever growing wealth of experience has been related and passed on for wider use, but men have kept on thinking of it largely as a scientific propaganda. The most important fact remains that this same science of illuminating engineering has marshalled to the service of the central station a great creative force for the development of further, bigger, better business in the lighting field.

It is because this fact has not been generally recognized with the enthusiasm it deserves and generates, once the idea is grasped, that we see so many central stations still going on without any real effort to treat their lighting business seriously. They seem to be content to sell just light—the raw material—instead of accurate illumination as the finished product. Yet we know well that by the systematic application of illuminating engineering, the profits of such lighting business can be immeasurably increased, as has been proved by the experience of many cities.

It is worth while, therefore, to consider what really are the actual basic, commercial purposes of illuminating engineering in the central station industry. There are three purposes:

1. To help develop new lighting business, by converting new customers to the use of electric light.

2. To improve the lighting of present customers and increase its usefulness and value to them; and in this way gradually to raise the standard of illumination throughout the community and thus, automatically, to increase the company's lighting business.

3. To promote the satisfaction of present customers by giving them better service and more effective lighting that will tend to make them regard more highly the influence and benefits of good illumination; and in this way ultimately to win for the company a greater popularity in the community.

The application of a campaign of good lighting necessitates a study of efficient lighting or of illuminating engineering.

The mastering of illuminating engineering does not entail an undue amount of work on the part of the central station management, as is perhaps assumed. The method of illumination, as has been shown, is well established. Likewise the educational work carried on with consulting engineers and architects presents little outside the ordinary business routine of preserving friendly business relations with them either by personal calls or correspondence or preferably by both. It is obvious that the larger central stations with correspondingly larger forces and interests can devote a keener study and activity to this work than the smaller stations, but it is likewise true that the larger communities also contain the large and more ornate buildings which demand a more careful study of the esthetics of lighting.

Central stations have from time to time promulgated plans to cooperate with consulting engineers and architects with varying success. But past results in no way nullify the fact that a more thorough understanding of the benefit of good lighting is essential to the architects, and that a closer cooperation is of paramount importance to both.

Central stations have likewise offered the services of their Illuminating Engineers or Lighting Specialists to the consumers through the method of newspaper advertising and handbills. But we fail to find that much concerted effort has been made to appeal directly to the class of business known as public buildings.

The following portray, first, an effort on the part of the Commonwealth Edison Company to inaugurate a plan or propaganda of education with architects, which having just been put into effect, permits of no conclusion as to its success; and, second, present a plan adopted by The Philadelphia Electric Company several years ago, to reach the controlling or governing bodies of all churches, the results of which both from the commercial standpoint and the standpoint of improved lighting (with its better satisfied consumers), fulfilled all expectations.

Commonwealth Edison Service

The rapid growth of the central station business, involving as it does all the many applications of electricity, with rates, rules and methods changing constantly, makes it extremely hard for anyone to keep posted on all the latest developments. Although the development nationally is along certain rather well defined lines, still each city has its own particular methods, plans and achievements which are of special interest to its own community.

Even those of us who are directly interested, as employees of central station companies, are at times hard pressed to keep in touch with all the latest phases of the art. Can we then blame those who are in contact only indirectly with our business, such as architects, builders and contractors, for not having complete knowledge of matters with which we may be quite familiar, and which if known and taken into consideration in the early stages of planning, would have resulted in a better and more satisfactory accomplishment from the architect's, the client's and the central station's standpoint.

To meet this condition many central stations issue a book containing the rules and regulations and other information pertaining to the company's service. This is of the greatest importance in disseminating information regarding the company's standard practices. But the book does not contain within itself the personal touch which is needed for fostering more cordial relations with its recipients, nor does its function embrace the indirect method of imparting information by means of a more pleasing and less formal method such as is suggested below.

In order to provide a point of contact with architects and others with whom it desires to foster closer relations, and whom it wishes to keep informed on subjects relating to central station service, the Commonwealth Edison Company of Chicago has just inaugurated a new plan, which in brief is as follows:

A special list of architects, builders and contractors was prepared, containing the names of those to whom this service will be offered. A 1-inch leather binder, 8½ in. by 11 in., which is the size recommended by the American Institute of Architects and the Illinois Society of Architects for filing purposes in architects' offices, will be provided for each architect. On the outside cover of the binder will be printed in gold lettering the oval "Edison Service" symbol, this appearing just above the words "EDISON SERVICE. Information Sheets."

At the bottom of the cover will appear the words "Commonwealth Edison Company, Chicago," and near the lower right-hand corner of the cover the architect's name will be embossed in gold lettering. The schedule of rates of the Commonwealth Edison Company as filed in the office of the State Public Utility Commission of Illinois, comprising a loose leaf booklet of some thirty pages, 8½ in. by 11 in., will be placed in position in the back of the leather binder when it is first issued. It is the intention to compile a series of information sheets somewhat on the order of bulletins, these to be handed by a representative of the Company to each of the architects on the list every time a sheet is issued, which will probably be once each month.

The Company believes that better results will be obtained by using these bulletins for the purpose of getting into personal touch with the architects periodically, than if material were to be sent them through the mail.

The following subjects for the information sheets have been suggested:

Condensed Information Regarding Edison Service and How to Secure It.
Standardization Of Modern Methods Of Interior Wiring.
Electric Lighting Up-To-Date.
Factory Lighting.
Electric Vehicle.
Residential Lighting (Plea for more outlets for appliances. Give list of several hundred appliances to clinch reasons).

Church Lighting.
Electric Motor Drive.
Flood Lighting.
Edison Service For Modern Office Buildings.

All subjects will be handled from the standpoint of the architect, will be interesting, lucid, condensed, and imbued with the "Public be pleased" spirit. Special tact and diplomacy will be exercised in getting out these information sheets so that the "At Your Service" spirit will predominate.

From time to time articles descriptive of some new installation embodying features of special interest will be issued, and blue prints and charts may be prepared for this purpose.

This plan should not be confused with plans of loose leaf catalogues or other similar schemes of advertising or exploitation, as the service contemplated by the furnishing of this binder and information sheets is that of a special courtesy to a very particular and special profession. Architects and architectural firms are swamped with all kinds of advertising schemes and their time is too valuable to be taken up with a great majority of the literature which is received at their offices. Unless this service is carried out on broad, ethical lines and furnishes something of real interest and value to the architect, it will not answer the purpose for which it is intended.

Philadelphia Electric Company's Church Lighting Campaign

The Philadelphia Electric Company, some several years ago, during its campaign for better lighting generally, realized that churches presented a field for its endeavors. Many of the churches had been built even before the advent of electric lighting, and they presented an opportunity for new business. The church load, while not as desirable perhaps as some other characters of business, furnishes an opportunity for off-peak business. Aside from this, the advantages from public welfare and from an advertising standpoint brought the doctrine of electric lighting before the public. The Philadelphia Electric Company prepared a very attractive sixteen page booklet with thirteen illustrations, on the subject of church lighting, which offered to the controlling church committees the services of the Company's

Illuminating Engineering Department for the purpose of preparing plans for proposed electric lighting and also suggestions to make existing electric lighting installations more efficient and modern. The text of the booklet follows:

Church Lighting

The importance of proper church lighting is too often minimized by pastors, church boards and those who have to do with church management.

Ordinary business methods are just as important in the management of the church as they are in every-day mercantile pursuits —*more* important because the objects to be attained are so much more vital to the entire community.

It is the *business* of those who manage church properties to see to it that attendance at church services shall reach a maximum—and *remain* there, and yet it is surprising how little is done to make our church edifices inviting and cheerful and comfortable.

There is no single factor which will accomplish this result so surely and at such small initial expense as a scientifically designed system of electric lighting.

Every one knows that any illumination which produces eye-strain or fatigue among the congregation is a positive force tending to reduce the interest of those who attend church services. Proprietors of places of amusement discovered this fact many years ago, and nowadays they look upon the use of electric light as a positive necessity.

From every standpoint electricity is surely just as important in the *church* as it is in the *place of amusement.*

Some Reasons Why

We emphasize the comparative methods employed by places of amusement and churches in the matter of making their audiences comfortable because there is a very real analogy which is too apt to be overlooked.

There is nothing in religion which teaches that those who attend church services should be made uncomfortable, and yet lack of forethought upon the part of those responsible too often makes attendance at church services a positive source of distress for those whose eyes are not strong or perhaps overstrained.

The principal reason for the use of electric light in churches is the ease of designing an installation which will not only give adequate and efficient illumination, but which will accomplish this result in a pleasing, restful manner.

No other illuminant can be utilized with similar success.

Another important factor is the better atmospheric conditions that exist wherever electric light is used—surely a matter of prime importance in any auditorium where human beings congregate.

The Economy of Electric Church Lighting

Irrespective of all secondary economies, such as a decrease in deterioration of furnishings, frescoing, paintings and fixtures, the low rates offered to churches, hospitals and charitable institutions in this city make the use of electric light less expensive than any other efficient means of illumination.

The new schedule of discounts from the present basic rates is as follows:

Bills between $10 and $15 gross per month are net $10; all bills exceeding $15 gross per month are subject to a 33⅓ per cent discount.

This exceedingly low and favorable rate makes the cost of electric light to the liberal user actually less than gas, and should result in the eventual use of electricity by every church in the city within reach of our circuits.

Those Who Use Both Electricity and Gas

We at the present time are furnishing electricity to more than 500 of the approximately 850 churches in Philadelphia. We find, however, in looking over our records that quite a few of the churches using electricity are also using gas for supplemental lighting of various kinds, as, for instance, illumination in hallways, Sunday-school rooms, assembly rooms, etc.

Wherever the combined electric lighting and other bills for illumination in a church exceed $10 per month the use of any other illuminant anywhere in the church property is an actual extravagance, because of the fact that the discounts mentioned above would make your electric light bill for exclusive lighting less expensive than the combined bills for two classes of service. Any church making use of auxiliary lighting for reasons of economy is making a mistake which is actually costing it money.

Our Illuminating Engineering Service

Illuminating engineers find the church lighting problem one of exceedingly great interest, due to the fact that the lighting effects demanded vary so greatly, not only with the type of church architecture but also with the religious denomination. Church illumination must not alone serve practical ends, but it is frequently necessary to give due consideration to religious symbolism. In evangelical churches, for instance, in addition to the general illumination, it is desired that the light be intensified upon the clergyman—this arrangement serving as a symbol. In the ritualistic churches, however, this intensified light is directed upon the altar for a different symbolical purpose.

Electric light, because of its adaptability, its great variety of lamps and efficient reflectors and properly tinted and designed glass shades, lends itself to the successful effects that individual consideration of the features of each church should receive. The general construction of churches is such that electric wiring may be easily and inexpensively introduced without defacing decorations and without interference with the regular services. We maintain an Illuminating Engineering Department which may be called upon without charge for advice and suggestions in the matter of lighting designs or wiring layout. We have done work of this nature for a number of churches in this city. We study the lighting requirements, draw up specifications, submit blue-prints and complete estimates—we do everything, in fact, but the actual wiring and placing of fixtures, which we recommend be handled by the responsible electrical contracting firms in the city which make a specialty of this class of work. Do not hesitate to call upon us: you will not be obliged to use our service because of any trouble or expense to which we may be put in submitting a comprehensive proposition to you.

Supplemental Service

While the principal function of electricity in the church is that of artificial illumination, there are a number of important supplemental uses to which it may be put. The use of an electrically operated organ is practically a necessity. It is so much more reliable and flexible than a water motor, or any other type of motor used for organ blowing, that an electric motor for this purpose may well be considered indispensable. Some churches utilize electricity for the operation of organ stops and valves. Ventilating and exhaust fans operated by electric motors have been found invaluable where the church auditorium, because perhaps of architectural design, is lacking in a proper ventilating system. Electric vacuum cleaners and their efficiency in the matter of creating more hygienic conditions are so well recognized as not to require lengthy argument. It is sufficient to say that in no auditorium where the public foregathers is it more important to guarantee cleanliness and comparative freedom from disease germs—the invariable accompaniment of dirt and dust—than in a church. Many churches in this city have already adopted the electric vacuum cleaning system.

Exterior electric illumination, in the way of ornamental lighting posts, entrance lighting and even sign lighting, has of late years developed to a surprising extent. This development is logical. Your congregation, of course, knows the time and the days upon which church services are held; the general public, however, does not, and exterior illumination points the way.

In Conclusion

Church officers and members of church councils and boards are, as a rule, too ready to exclaim, when the matter of introducing electricity is broached, "We cannot afford it, we haven't sufficient money for our daily church needs." In answer to this we wish again to call attention to the fact that this is, after all, a business proposition. We believe that we can show you an actual saving in your lighting costs. We believe that a proper system of illumination would not only be appreciated by your present congregation, but it will increase the attendance at your church services, and, therefore, increase your revenue.

Isn't it at least worth investigating? The method we prefer to pursue is, after consulting the proper authorities at your church, to prepare plans and estimates and have our representative appear before one of your regular monthly meetings in order to explain to your entire board the details of the proposition and to answer all questions and objections which might be raised by the pastor or the individual members of the church council. In writing or telephoning, please address the Illuminating Engineering Department of

THE PHILADELPHIA ELECTRIC CO.,
Tenth and Chestnut Streets

The Committee is endeavoring to promote close relationship with the proper authorities in Washington in order to encourage their realization of the advantages of good lighting in our National buildings throughout the country; also to ascertain from them at the earliest moment where such buildings are to be located. The Committee will then notify the lighting company in whose territory the building will be erected, in order that it can take up with the local authorities the matter of service.

The Committee offers for your consideration the suggestion that the central stations throughout the country inaugurate an energetic plan of good lighting, and further that the National Electric Light Association prepare, for the use of the member companies, uniform non-technical monographs on the subject of efficient lighting, not only of public buildings, but of all classes of lighting installations; illustrating various kinds of each of the several respective classes, with detailed descriptions.

A treatise on church lighting, for example, would contain illustrations of the various types of architecture and the several methods of illuminating them along the lines of the following.

St. Paul's Episcopal Church,
Cleveland, Ohio.

The church shown in the accompanying photograph is lighted in an unusual manner in that while appearing as a semi-indirect installation, in reality the illumination is obtained directly from the fixtures. The bowls are covered over with an opaque material

St. Paul's Episcopal Church, Cleveland, Ohio

with a good reflecting surface on the interior. The bowl itself is constructed of leaded panels of a diffusing white art glass, containing sufficient amber to give a certain warmth and fire to the fixture. Direct lighting alone in a building of this character would result in too little light in the upper recesses of the ceiling, and a consequent gloomy effect. This was obviated by the construction of a conical mirrored-glass lined reflector forming a part of the cover of the bowl, and directing light toward the ceiling.

Four hundred watts are installed in each bowl for the direct lighting, with an additional one hundred watts for the indirect, or upward component. The spacing is such that this results in a total of slightly more than one watt per square foot of floor area.

The fixtures are mounted at such a height above the floor that they are considerably above the range of normal vision. The brightness of the bowls is less than three-quarter candle power per square inch, or considerably below the limiting brightness which under these conditions would produce discomfort to those in the room.

The lighting of the chancel and choir is obtained by a row of small lamps equipped with angle steel reflectors located behind the arch at the front of the chancel. The lighting units are entirely hidden from view and produce an illumination for the choir and pulpit of considerably higher intensity than that in the auditorium.

GRACE CHURCH, NEW YORK CITY

GRACE CHURCH,
NEW YORK CITY

The lighting system for the auditorium of Grace Church, as shown in the accompanying illustration, is particularly satisfactory both from the standpoint of artistic appearance and illumination obtained.

Over the main portions are located four 500-watt mazda C lamps in opalescent glass semi-indirect lighting units. These are supported from the ceiling beams by a ten-foot chain suspension.

Above the gallery are installed 200-watt mazda C lamps in fixtures similar to those used over the main portion of the auditorium. These are supported by four-foot chain suspension. The illumination underneath the gallery is supplied by nine 100-watt mazda C lamps in enclosing globes located nine feet above the floor.

GRACE EPISCOPAL CHURCH,
NEWARK, N. J.

This building is of the early English period of the Gothic type, and as there are no side aisles in the auditorium, the hammer beams offer a logical place from which to suspend the lighting fixtures.

The lighting units consist of 150-watt bowl frosted mazda lamps, equipped with Alba glass bowl reflectors, hung sixteen feet above the floor by a simple brush brass chain suspension. The daylight appearance of this installation is pleasing, and, when lighted, the diffusion and distribution are very satisfactory. Both the design and placing of the fixtures harmonize with the architectural features of the interior.

An illumination test of this installation showed that an average intensity of 1.3 foot candles was obtained. The illuminating efficiency is not particularly high, due to the fact that a large portion of the light flux is transmitted by the reflectors and serves to illuminate to a low intensity the dark, decorated ceiling which has a low coefficient of reflection. This ceiling illumination is, however, quite necessary, as otherwise, if the ceiling were dark, the room would present a gloomy appearance.

As indicated by the illustration, the sanctuary is the most brightly lighted portion of the church. Behind the chancel arch, on each side, are located two enamel steel angle reflectors hung pendant, the lower lamps being 150-watt and the upper 200-watt clear mazda lamps. The average horizontal illumination obtained here is about 3-foot candles for the choir stalls and 1.2-foot candles at the base of the altar.

Grace Episcopal Church, Newark, N. J.

Hillside Presbyterian Church, Orange, N. J.

This building, which is of the modified Gothic architecture, was originally lighted by means of massive multi-light gas fixtures, which, although of a harmonious design, did not give satisfactory results from an illuminating standpoint.

The lighting units were low hanging, consequently the unshielded light was a source of annoyance to the congregation. In addition to the overhead lights, there were wall brackets of a similar character. The installation shown in the illustration, consisting of mazda lamps and opalescent reflectors, replaced the original gas lighting system.

Ten 150-watt bowl frosted mazda lamps equipped with dense opalescent bowl reflectors, supported by a specially designed suspension, were installed. These units were hung about twenty feet above the floor. In addition to these units, there was installed at the crossing of the nave and transept, one 500-watt bowl frosted

HILLSIDE PRESBYTERIAN CHURCH, ORANGE, N. J.

mazda lamp in a fixture similar in design to the ones used for the smaller lamps. Illumination for the choir is supplied by 40-watt mazda lamps and metal reflectors located behind the cornice.

Very satisfactory results are obtained from the lighting system, as there is sufficient intensity and good diffusion, and the lighting units are so placed that they are not annoying to the congregation.

ST. HELENA CATHEDRAL, HELENA, MONT.

This illustration shows a typical Gothic interior with long vertical lines and arched ceiling. In order to preserve this feeling of loftiness, a system of illumination of a more or less unique character was designed. This system consists of a combination of direct and indirect lighting. The indirect lighting units, as is evident from the photograph, are placed in the caps of the columns, both the lower and the upper caps. The light from these units is directed to the ceiling and illuminates the entire

St. Helena Cathedral, Helena, Mont.

interior with a soft, perfectly diffused light, contributing somewhat to the reading illumination and also bringing out the architectural features of the interior.

Supplementing these units are direct lighting reflectors placed in the ceiling at the apexes of the arched ceiling. These units are accessible from the attic, and are arranged so that they can be lifted out of place for cleaning and renewal of lamps.

The ceiling of this interior is 56 feet high. The size of the nave is 32 feet by 68 feet. The average watts per square foot for the direct lighting equipment are 0.57, and for the indirect lighting 0.51 watts per square foot, making a total of slightly over 1 watt per square foot for the entire area.

Timothy Eaton Memorial Church, Toronto, Ont.

The illustration of this church interior shows how a typical dark finished Gothic interior may be illuminated with indirect lighting, employing the luminous type of fixture. The ceiling be-

Timothy Eaton Memorial Church, Toronto, Ont.

tween the heavy dark oak beams is finished in a light color to act as reflecting surface for the indirect illumination.

The main auditorium, which is 45 feet wide and 120 feet long, has a ceiling height of 57 feet, and is illuminated by four large fixtures of Gothic design in harmony with the general architectural treatment of the interior. The transepts are each 23 feet by 38 feet and are taken care of by one fixture similar in design to that suspended in the main auditorium space.

Under the balconies, a similar type of fixtures suspended near the ceiling is employed.

An important feature in connection with an installation of this kind is the necessity of providing a means for lowering the fixture for the cleaning and renewal of lamps. Each of the large fixtures is provided with a winch which is set above the ceiling, by means of which the entire fixture may be lowered to the floor. The electrical connections are automatically broken when the fixture is lowered, and again automatically made when the fixture is again raised into place.

On installations of this character, the lowering of the fixtures should be taken into consideration when the lighting system is planned.

First Church of Christ, Scientist, Oak Park, Ill.

The illumination of this interior is accomplished without the use of hanging ceiling fixtures. Cove lighting is the method employed. Indirect lighting from coves is one of the oldest forms of illumination from concealed sources and was applied for large interiors in many instances in the early days of the incandescent lamp.

This is an ideal method for displaying the architecture of the interior as a harmonious whole. Many possibilities in the

First Church of Christ, Scientist, Oak Park, Ill.

illumination of interior by the cove method have been opened up since the advent of the high efficiency mazda lamp.

In this particular case, the special lighting reflectors are concealed in the cornice which borders the high ceiling. The units consist of a special reflector of a peculiar shape designed to prevent light splashing against the wall back of the reflector, and at the same time designed in such a way that the light would be projected onto the ceiling away from the wall, thereby eliminating the dark and light areas which ordinarily occur when special reflectors are not used.

In addition to the units in the coves, special reflectors are placed in the tops of the window casings for the illumination of side areas.

The size of this auditorium is 74 by 95 feet, and the height of the ceiling 36 feet at center and 22 feet on sides. The wattage consumed is 1.52 watts per square foot.

In conclusion this Committee, in making its initial report, regrets that owing to the very limited time at its disposal, it was unable to prepare a more complete report.

Respectfully submitted,

G Bertram Regar, *Chairman*
Ward Harrison, *Vice-Chairman*
M T Blackwell
H A Brooks
F A Gallagher
O R Hogue
C L Law
Wm H McBride
A B Oday
J L Stair
C S Walton

The Chairman: Mr. Blackwell, do you want to discuss this?

W. T. Blackwell, Bloomfield, N. J.: It seems to me that the question of the proper lighting of public buildings offers to the central station man possibly one of his most difficult problems.

Ordinary methods of new business promotion cannot be applied successfully to public buildings. For ten years I was connected with the department which had charge of lighting public buildings in New York City, and I know something of the difficulties of obtaining money to improve the lighting of such buildings.

In short, it is a very involved proposition. You will find that most of the engineers in charge of the lighting equipment of public buildings realize the shortcomings of their lighting equipment and yet they have not the power to remedy the conditions.

Funds are obtainable only at certain periods of the year when the annual budgets are made up, and prior to this estimates must be prepared and be approved before being presented to the Board of Estimate or governing body.

This is the condition in the large city, while in the smaller city or town it is somewhat simpler. Take for example a small town of from 10,000 to 20,000 inhabitants. As a rule there is no electrical engineer in charge of such buildings and all engineering work is done by architects or engineers obtained for the purpose. If it happens to be a new building, the architect generally designs the illumination together with the other features of the building.

My comments, however, will be directed to the buildings which are now erected. It seems to me that each case must be handled separately and that there is no general rule which can be applied to cover all buildings of this type. By this I mean that the central station should bring the subject of lighting to the attention of the authorities in charge of such buildings and endeavor to cooperate with such authorities in their efforts to secure the necessary funds to improve the lighting. This can be applied more or less generally in both large and small cities.

Among the public buildings, public schools seem to have received considerable attention in the past, but during the last two years I have traveled considerably and was very much shocked to note the conditions of schools in small towns in the East and also Middle West. In many cases I have found the rooms lighted with open flame gas jets. It seems hard to realize that such conditions should exist and that there should be such a lack of public spirit in towns that conditions of this sort have not been made a matter of public welfare.

There is very little building going on at the present time, and it seems to me that the opportunity of the central station is toward the rehabilitating of the lighting equipment in the buildings now erected. The lighting of these buildings was designed in the days of the carbon lamps and no changes whatever have been made except to change the type of lamp, with the result that the majority of the public buildings are using a multiplicity of small units, whereas much better illumination can be obtained from the use of the larger mazda C lamps. This would result not only in better illumination, but would also tend to decrease the maintenance of the building by decreasing the number of sockets and would also lower the cost of supplying lamps.

I recall a case in New York of a municipal ferry terminal. The waiting-room was lighted with approximately 278 25-watt lamps. The original layout consisted of 16-candle power carbon lamps, and as other forms of lamps were developed they were installed. We experienced great difficulty with the theft of lamps, particularly when a new type would be installed. When the building was first equipped with the tungsten lamp we lost 400 in one month. Funds were finally obtained so that we were able to install 16 pendant fixtures in the center of the room and equip them with 300-watt lamps, thus doing away with 278 smaller units. This naturally resulted in lowering the cost of maintaining electrical consumption in this building and also in a material reduction in current.

I believe that the next type of building which should receive attention is the hospital, both public and private. In New York City even to this day there are hospitals where not only the wards but also the private rooms are illuminated by means of old clusters having porcelain enameled reflectors. It does not seem possible in this enlightened age that while so much progress has been made in surgery and hospital equipment so little attention has been paid to illumination. It is only recently that many of the city hospitals have been changed over to indirect lighting, and

I think I may safely say that there are still many hospitals using the old clusters.

The same conditions exist in practically every city throughout the country. It is in cases of this sort that the central station can do much good work by arranging experimental installations and arousing an interest on the part of hospital authorities in better illumination.

The Illuminating Engineering Society, through its code of lighting schools, has started propaganda which is going to be of great benefit, and this, I feel, should be followed by a code of lighting hospitals. The same holds true in regard to railroad terminals, ferry terminals, docks and piers, etc. During the Railroad Administration's operation of the roads, improvements of that sort have been practically impossible, but it appears now that the railroads will shortly be turned over to the operating corporations, and there seems to be a splendid opportunity for arousing the interest in better lighting of such types of buildings. In New York City a number of piers operated by one of the large railroad companies are even at this time lighted with open flame gas burners.

With the growth of our Merchant Marine and the attendant development of docks and piers there will be a splendid opportunity to create a demand for better lighting of such docks and piers.

To summarize my remarks, I would state that the whole problem of lighting public buildings seems to me to be one where ordinary sales methods cannot be successfully applied and one whose importance must be studied carefully and the necessary steps taken to arouse interest not only in the department occupying the buildings, but also to back up its requests for money through the governing municipal bodies.

Cities are judged to some extent by their monumental buildings, and we find only too often that the beauty of these buildings is marred by the lack of attention to their proper illumination.

THE CHAIRMAN: Mr. Jones, will you say something?

BASSETT JONES, New York City: Mr. Chairman and gentlemen, I am not going to talk about the lighting of public buildings; I am going to talk a few minutes about lighting buildings in general. Before I say anything more, I want to draw your attention to the next issues of the Journal of the American Institute of Architects (May and June, 1919), in which will be published the first draft of the Lecture to Architectural Students prepared by the Committee on Lecture to Architectural Students of the Illuminating Engineering Society. The Editor of the "Journal" came to me about a month ago, saying that the psychological moment had arrived to drive home some truths about lighting; the profession of architecture had failed to function during the war; the architects were generally down and out, and they were now ready to learn some needed lessons. Let us hope that they do so.

As has been said here, the architect is a very difficult man to handle. This difficulty is largely due to his education. The profession of architecture, as I have often told architects, is a sort of Taotism—a cult looking back to ancestral conditions and not to the future. The architect cannot get over the fact that in the Seventeenth Century candles were the commonly used light sources, and many beautiful designs were made of fixtures to hold candles; so he sticks to candles as a motif in lighting design.

I was in a building in Philadelphia not long ago, a very beautiful room with dark ceiling and dark walls wonderfully carved in black walnut. The room was lighted with very beautiful fixtures, too. The fixtures had porcelain candles capped with bare frosted lamps. The result was an excessive brightness contrast, considerably over a thousand to one. The eye was blinded and could not see the room at all—see, I mean, in the artistic sense.

One of the most beautiful interiors in America is, I think, the interior of the main banking room of the Guaranty Trust Company in New York, yet it is ruined by the lighting. And as this particular case indicates the architects' viewpoint very well, I am going to tell you something about it.

The fixtures for this room, in the opinion of the architects, could be designed by only one man—Edward F. Caldwell. Mr. Caldwell was perfectly capable of designing the most beautiful things in bronze. There is no question about that. He did the best work in this country. But he did not produce lighting fixtures.

The designs for these particular fixtures called for a total of nine hundred lamps. They had simply been so sketched in by the designer as part of the design. When they came to pick out the lamps they scaled the drawings and found the nearest bulb that would fit into the design, picked them out by scale, bought them and put them in. That the nearest size bulb contained a 40-watt filament made no difference. Nine hundred 40-watt lamps were installed and lighted. The room was literally smothered in light.

They then threw up their hands, and I was sent for. I set up a dimmer bank on the circuit and dimmed the lamps until the architect said, "There, that is just right." Then we computed the lamp wattage that should have been used and found there was not one small enough made. So we had them made. The lamps finally used were 5 watt 130 volt filaments burned on 118 volts. These filaments were put in 40 watt bulbs, frosted and dipped in two coats of amber colorine to get the light down still further; and then the room was right.

Of course, in time, the bank ran out of the special lamps and put in 15 watt lamps. At present it is burning one-third of the lights in the fixture. The result is a brightness contrast and glare so great that here again the eye is blinded and the wonderful design is lost.

The whole matter really comes down to a statement made by Dr. H. E. Ives some years ago. "The art of good lighting is the art of the proper distribution of brightness." And when you have said that, you have said nearly all there is to lighting. This axiom should be the slogan of everyone who is doing lighting. It is, in my opinion, the keynote of good lighting.

Somebody mentioned here the lighting of churches. A church cannot be lighted. That is all there is to it, provided it is a Gothic church. The Gothic is essentially a design of dim distances, shadows, mysterious depths. It breathes sentiment and religious moods—almost sombre. Light it and all its charm is gone. If you want a church that must be lighted, use Georgian (Colonial) or Roman Classic—but not Gothic.

G. H. Stickney, Harrison, N. J.: The term "over lighted" has often been applied to artificial lighting in public buildings

A commission investigated the lighting in offices in Manhattan and reported them as "over lighted." To anyone versed in lighting practice, this is absurd. There are hardly any places where more artificial light, properly applied, would not improve rather than detract from the usefulness of the illumination. Over lighting is generally charged where the real trouble is brilliant light sources shining in the field of view, even though the actual quantity of light in the room is relatively low.

When the light sources are provided with diffusing equipment a certain amount of light is lost by absorption, but the resultant illumination is likely to be more useful. On the other hand, illuminating engineers find in actual experience that when changing the equipment to eliminate glaring conditions it is usually advisable to provide stronger illumination. People usually demand a higher intensity of diffused light because it can be had without the objectionable glare.

Properly diffused lighting, therefore, means less complaint, better satisfied customers and higher current consumption, and from every point of view should be advocated by the lighting industry.

Many of us are liable to neglect public buildings because they are not, as a rule, long hour burners and therefore not particularly profitable from the revenue standpoint. Public buildings are, however, important from the educational standpoint and exert considerable influence on the practice in other classes of lighting. This was pointed out to me in an instance where we had planned the lighting of a small church. One of the trustees of the church was an official of a large insurance company. We had recommended an improved lighting installation for the office building of the insurance company, but it had been held up for approval of the expense. At the demonstration of the church illumination, the trustee asked Mr. Powell why they could not have such good illumination in the office building. When informed of the situation this man promptly approved the change and the office building was reequipped.

We cannot often point to such definite instances of the influence of public building lighting, but a little thought will be quite convincing of its existence.

Many of our public buildings are poorly lighted. Even the lighting of the Engineering Societies Building has not been what might have been expected of a building with such a relation to the lighting industry. I have always thought of the reception lobby as a dingy sort of place, although I did not give it much attention until asked to advise on the lighting. But little daylight ever reaches it, and the artificial lighting is so arranged that almost no light could reach the ceiling of the central section. It was even planned to sacrifice architectural effect and put in ceiling fixtures. As a starter, however, we tried four floor standards arranged to throw light on the ceiling. Because of haste we were unable to secure glassware of suitable depth to produce the best effect; but the improvement was enormous. Those of us who were studying the effect of the change realized that we had never seen the beautiful lobby before; we now see the costly decorations that had been hidden in the darkness.

This is neither an ideal nor an extreme case, but simply typical of what the condition is in a large number of public buildings which are waiting for the lighting representatives to beautify them with light and render the investment useful. Such lighting, of course, should be done in cooperation with an architect who is competent to decide what sort of an effect best reveals the beauty of the design. The illuminating engineer can point out many opportunities for extending lighting service, and also help assure that the lighting installed will be useful as well as ornamental.

Joseph D. Israel, Philadelphia: It would appear from Mr Regar's Committee report that he anticipated the discussion between our friends Joe Becker and Leon Scherck. If they will read carefully the opening paragraphs of the report, they will receive the answer to the questions which they have in mind.

I think the discussions on the papers this afternoon show most emphatically, and I say this as Chairman of the I.E.S. Committee on Reciprocal Relations with Other Societies, that the members of the Lighting Sales Bureau of the N.E.L.A. should get in closer cooperation and harmony with the Illuminating Engineering Society.

Mr. Regar: There seems but little to add in closing. The trend of the discussion has shown that the lighting load of our business has not been given the attention it deserves or demands.

Mr. Scherck has answered Mr. Becker in saying that the lighting throughout the smaller cities is poor and has shown a neglect on the part of those responsible.

I was extremely glad to hear Mr. Bassett Jones say that the architects were beginning to realize the importance of modern lighting. They have been responsible for much of the poor lighting that is existing today, and they can be the means of correcting much of that defect in the future.

Replying to Mr. Israel's remarks as Chairman of the Illuminating Engineering Societies' Committee on Reciprocal Relations with Other Societies, relative to closer cooperation between the central stations and the Society, I desire to add, as his secretary, that I have not had an opportunity to report to him that a conference has been held beween Mr. Frank Birch, Chairman of the Company Section's Committee of the National Electric Light Association, and Mr. Stickney, Chairman of the Papers Committee of the Illuminating Engineering Society, for the purpose of obtaining papers on illumination to be read before various of our N.E.L.A. Company Sections.

Mr. Stickney in his discussion has brought out the point of the advertising value of good illumination. You will agree that the psychological effect of lighting is of paramount importance.

We have been advised by the officials in Washington of the proposed erection of 325 buildings throughout the country. The National Electric Light Association is writing to the central stations in whose territory these proposed buildings will be located, calling their attention to the fact and urging upon them the advisability of doing everything in their power to call the attention of the officials interested to the advantages of efficient lighting.

In conclusion, it seems to me that if we set out with some set purpose in view, for instance, let our first goal be hospital lighting, and endeavor to make that class of lighting throughout the entire country good and efficient, we will be achieving a result to be proud of, if only from the humanitarian side. I believe the public demands the best that the central stations can give, and I trust we will all get together and carry on a propaganda of good lighting, not only for public buildings but for all lighting connected to our load.

THE CHAIRMAN: Is there any further business? If not, the meeting is adjourned.

(At 5:20 p.m. the meeting adjourned.)

THIRD COMMERCIAL SESSION

POWER SALES BUREAU

Wednesday, May 21, 1919

MARTIN J. INSULL, Chairman.
CHARLES J. RUSSELL, Vice Chairman.

The Chairman called the meeting to order at 2 P. M.

MR. INSULL: It gives me a great deal of pleasure to have the opportunity of opening the Third Session of the Commercial Section, and particularly that of the Power Sales Bureau, as the work of the Power Sales Bureau is some of the most important work that is done in the industry. The sale of energy for heating and the development of the electric power business are very important features in our work.

I see you have quite a long program this afternoon, and I am not going to take up any time trying to make a speech, but will turn the meeting over to the Chairman of the Power Sales Bureau, Mr. George H. Jones.

GEORGE H. JONES, Chicago: Mr. Chairman and Gentlemen, It is gratifying to note that during the war period the central station companies performed a very important service, principally in the furnishing of power for essential industries. The demands on us for electricity for this purpose were enormous and as a consequence our power business grew by leaps and bounds, and many new problems arose which needed solution.

This program has been prepared with the idea of bringing out the important points with the hope that a general discussion will result. The topics to be presented are all actively before us at the present time and are among the vital subjects requiring attention by us at the moment.

In order to expedite matters and bring out all the important features, the discussion has been organized, but we wish every one to feel entirely free to take part in it, and in fact, we urge you to do so. The first topic is a very timely one and is entitled "The

Effect of the War on Isolated Plant Costs." I will ask Mr. Lundgaard, of Rochester, to open the discussion.

I. LUNDGAARD: Mr. Chairman and Gentlemen, I wish to plead guilty to having been a real chairman in connection with this discussion. The suggestion for the topic came from Philadelphia, from Mr. Russell, and I thought Mr. Russell was very careless in making suggestions because I turned around and said to him, "This is a fine topic, and we want to go into it very thoroughly; undoubtedly you have already given quite a little thought to it and I wish you would undertake to present the subject to the meeting." But Mr. Russell had not been as careless as I thought he was. He said, "I agree with you, except that I will have Mr. Meyer present the subject." And Mr. Meyer very kindly agreed to open the discussion. I just want to say this in connection with the situation that seems to be prevailing throughout the country: During the war our loads increased tremendously, our costs went up, and some of us had to raise our rates moderately in order to get along; but on the whole we got along fairly comfortably. Now the war is over and most of us find that our loads have dropped off considerably, but costs have not come down correspondingly. The cost of labor is higher than it has ever been; the cost of coal is a little lower than it was, but not appreciably so; taxes are high, rates for money are something relatively enormous, and with the decreased revenue due to loss of business, most of us are in a hole.

Now, there are one or two things we can do. We can raise the rates, which is much against the desire of the public at the present time; everybody is looking for a decrease of cost, and raising rates at this time would probably not be advisable if it can possibly be avoided. Another way is to go after new business and put on loads that will make up for the loss of revenue and put us, so far as the sale of electricity is concerned, back on the war basis.

The central station business has passed into a new phase. I think it is generally agreed that the central station is practically going to monopolize the power business of the future. With our big units and high efficiency on the one hand and the increased cost of isolated plants, buildings and operation on the other hand, the competitive situation has been substantially changed.

It seems that the thing to do is to organize effectively for bigger business, and to perfect the sales organization so that no opportunity for getting more business will go by. We must get the facts. We must know all about our own costs and we must know all about competitive costs. That is the purpose of the discussion to-day.

I will not take any more of your time, but will ask Mr. Meyer to come forward and present his paper.

THE EFFECT OF THE WAR ON ISOLATED PLANT COSTS

By John W. Meyer

Some time in November, 1918, after an extended period of intimate contact with costs, Mr. C. J. Russell, recognizing the fact that costs were advancing beyond anything heretofore known, suggested the investigation which it has been my pleasure to present.

Between thirty and forty letters were mailed to scattered companies, requesting reports of isolated plant operating costs for the year 1918 as compared with the year 1916. Only a few companies replied.

With one or two exceptions very general statements were made. It was generally admitted that prices were higher, but apparently no attempt was made to determine the extent of the rise.

From the data received, a number of cases were selected which were believed to typify general conditions.

The conclusion reached justified the presentation of this subject in the form of the following report:

During the past few years prices have been advancing in a manner unprecedented in the history of central stations. This advance has been reflected in the price of practically every commodity and has been felt by every human being. The isolated plant owner has not been without the scope of its influence, not alone in the matter of costs, but also in the question of quality of labor employed and in material and equipment purchased. There have also been introduced a number of questions which the owner heretofore did not appreciate existed, but which he now knows are inherent in plant operation. These questions he must consider in the future in determining the relative merits of central station supply and of isolated plant operation. They, however, suggest an entirely new line of thought in advertising and sales campaigns for this class of business which will be developed as we proceed.

If we plot either actual prices or index numbers of prices preceding the declaration of war, August, 1914, but excluding panics and depressions and their opposite, abnormal prosperity, we will find that the curve will show advances with marked regularity and following very closely the gradually ascending level of living.

The prices of practically every commodity seem to be cyclical, passing through periods of enhancing value only to recede, but in normal times seldom to the previous minimum point. Prices in general pass through a cyclical period, but of a longer duration, having, however, all the characteristics of the individual commodity cycle, except as to the time element.

The fluctuations in price are ever present and the power and ability to purchase when prices are low and sell when they are high very frequently distinguish the successful from the unsuccessful business. Purchases and sales must in general anticipate the high and low points of these cycles. The business of producing current by isolated plant, can, to only a very small degree, take advantage of cyclical purchases, utilization or sales. It must purchase labor, coal and other commodities as required by the constantly fluctuating demands, eliminating almost entirely the advantages accruing to other classes of business which are enabled to purchase and store in quantities when prices are low and whose unfilled orders represent the production of plant capacity for months in advance.

Though it might be expected that current generated by isolated plants follows the same general characteristics of production—the object of manufacture—the opportunity to purchase in quantity the raw materials of current generation is very limited as compared with the opportunity to purchase raw materials for production. The time element opportunity to purchase current generation raw material is short as compared with the time element opportunity to purchase raw materials for production.

In the term "current generation raw material" are included such items as boiler, engine and generator equipment, labor and coal, in contrast with the term "production" meaning the final product manufactured.

Very slight expansion or contraction of the time element may permit of advantageous purchases. When, however, the demand for raw material takes a very rapid rise, coinciding with a period of restricted production, the consequent disadvantageous condition is materially amplified and precludes any opportunity to make advantageous purchases. The problem then is to purchase at any price.

Such were the conditions prevailing during the last few years.

Plant owners were further handicapped by the fact that plants which heretofore had a reasonable margin of capacity were required to carry overloads and to operate longer hours per day. Not only were plants inadequate from a capacity standpoint, but as well from the standpoint of regulation and its effect upon quantity and quality production.

Plant labor because of its knowledge of machinery, came under the influence of higher wages paid by munition plants, etc., thus increasing wages paid to this class of labor by substantial figures. The continuous operation of the power plant was necessarily one of the essential factors in winning the war and it had to pay the price.

Plant installations made to meet normal conditions were allowed a reasonable margin of capacity varying with each plant. Abnormal demands in the load utilized this margin, necessitating the installation of additional equipment, if such could be procured. The space occupied by the original plant was believed to be adequate for the building needs, and additions thereto very frequently encroached upon space then used for the more important purpose of producing goods upon which profits depended.

Except in a few cases of careful design, the plant was almost invariably in a congested and out-of-the-way place. When additions were necessary under circumstances existing in the last few years, space never intended for plant equipment was utilized at a considerably greater expense than during normal times.

Heretofore the turnover of plant labor had not been a serious matter, this labor appearing to be satisfied with its employment, the quantity of work and responsibility involved and the wage paid, these conditions varying with each establishment. Plant employees because of age or partial physical disability, doubting their ability to cope with the intensive war conditions, continued in the same position at an advanced wage.

The more physically fit took advantage of the better opportunities offered, although these opportunities proved to be of a temporary nature.

Past experience has demonstrated that this class of labor seldom suffers a reduction of wage.

Whereas, the price of labor was governed principally by the law of supply and demand, the price of coal was regulated by the Government.

The Fuel Administration fixed the price of coal at the mines, to which was added a 75c. differential allowed only the individual operator. The freight charge was fixed, varying with the location of the mine, the kind of coal handled and the carrying railroad. A war tax of three per cent (3%) on the freight charge and the dealers' margin of $2.50, Philadelphia territory, combined with the other items mentioned above made up the price of anthracite coal per ton.

The 75c. differential was omitted in determining the price of bituminous coal. The dealers' margin was not regulated.

Recent figures seem to indicate that the dealers' margin of $2.50, while a reasonable charge for 1916 and the earlier part of 1918, was too low for the months of January and February, 1919, the analysis showing that the retail cost for these months was $2.94, not including dealers' profit, as compared with the $2.50 which included profits.

An unsuccessful attempt was made to combine all grades of coal with the several charges outlined above to determine an average price per ton. The difficulties we experienced in attempting to arrive at an average figure per ton were due to the fact that all grades of coal were purchased from company and individual operators and carried over different roads.

Some idea of the increase in coal prices per ton in 1918 over 1916 may be obtained from a study of 25 cases as follows:

	Coal Cost per 2000 Lbs. Buckwheat	
	No. 1	No. 2
1918 average	$6.79	$6.00
1916 average	3.90	3.47
Increase	$2.89	$2.53
% Increase	74%	74%

The foregoing prices are the averages of prices paid and not weighted average.

For the purpose of obtaining some idea of the influence of rising prices on plant operating costs, a letter was issued to a number of member companies requesting operating cost data of plants for the years 1916 and 1918, the estimated cost of heating, the competitive cost and the central station charge for similar service.

Table No. 1 is a specimen of the form and substance of the data received.

TABLE I

	Year Ending 3/1 1916	Year Ending 3/25 1918	
Operating Expenses			
Coal	$6,262.93	$10,800.00	
Labor	4,732.00	5,420.00	
Oil, waste and supplies	202.17	230.00	
Ash removal (free in 1916)	—	250.00	
Repairs and renewals	100.00	500.00	
Water	300.00	300.00	
	$11,597.10	$17,500.00	Inc.50.9%
Heating	5,106.00	6,344.00	Inc.24.2%
Competitive cost	$6,491.10	$11,156.00	Inc.71.0%
Cost of Central Service Station	9,674.40	9,674.40	
Loss	$3,183.30	Saving $1,481.60	

Details of Operating Expenses:

Kilowatt Hours

The kilowatt hours based upon test equal.......... 239,150
Same figure has been assumed for 1918.

Coal

Total coal 1916....1761 tons Buck. No. 1 @ $3.58 average
Total coal 1918....1800 tons Buck. No. 1 @ $6.00 average

	1916	1918
Labor		
Chief Engineer	$1,300.00	$1,500.00
Assistant Engineer	988.00	1,200.00
Assistant Engineer	936.00	1,040.00
Fireman	780.00	840.00
Helper	728.00	840.00
	$4,732.00	$5,420.00
Heating Estimate		
Coal, 540 tons	$2,106.00	$3,240.00
Water	250.00	250.00
Labor—		
1 Engineer	1,300.00	1,300.00
1 Engineer	936.00	936.00
1 Fireman @ $17 (7 months)	514.00	514.00
Total	$5,106.00	$6,240.00

The operating expenses in the case cited are given for years ending March 1, 1916, and March 25, 1918, and show an increase of 50.9 per cent. The heating estimate shows an increase of 24.2 per cent, which has been determined by applying the known 1916 and 1918 unit prices to the estimated quantities. The cost of central station service is based on the metered kilowatt-hours for 1916 period and the prevailing rate for 1916 and 1918 period.

The details of the operating expenses are given for reference. The case typifies the method pursued in studying other cases.

Of the cases reported five have been selected because of their completeness of detail and because they more nearly represent prevailing conditions. These cases have been carefully analyzed and the results are shown in the following tables and curves:

TABLE II

Kilowatt-Hours, % Increase Operating, Heating and Competitive Expenses

	Annual Kw. Hours	Increase in %, 1918 over 1916 Operating	Heating	Competitive
A 1916	32,000	79.9	50.8	147.0
1918	36,000			
B	40,000	34.4	47.3	30.6
C	42,000	42.3	46.6	38.2
D	100,000	55.9	38.2	122.0
E	239,150	50.9	24.2	71.0

The absence of any regularity in the percentage operating expenses is apparent. One might expect to find the percentage increase somewhat uniform; the absence of this uniformity may be partly due to the limited number of cases studied, but it is evident that a wide variance in the cost of production does exist and that there is no definite relation between the kilowatt-hour output and the operating expense. Each case must be determined upon its merits.

There appears to be no explanation of why the heating percentage increase should not have corresponded to the increase in operating expenses.

Competitive cost percentage increase would, of course, be higher as the heating percentage increase is lower.

TABLE III

Percentage of Labor and Coal to Total Operating Cost

	Labor 1916	Labor 1918	Coal 1916	Coal 1918	Labor and Coal Comb'ed 1916	Labor and Coal Comb'ed 1918
A	42.4	30.2	48.4	61.8	90.8	92.0
B	44.9	43.7	48.5	54.2	93.4	97.9
C	46.5	37.5	45.9	54.9	92.4	92.4
D	26.4	23.5	55.6	61.8	82.0	86.3
E	40.8	31.0	54.0	61.7	94.8	92.7

There has been no substantial change in the relation of coal and labor combined to total operating expense.

As coal was the item most affected by increased prices, labor showed a reduction in the percentage of the total 1918 over 1916. The average combined labor and coal for 1916 for the five cases was 90.8 per cent, whereas in 1918 it was 92.3 per cent. We might expect, therefore, to find that on the average labor and coal will represent approximately 92.3 per cent of the total operating expense.

Table III-A shows the coal and labor expenses and the increase in dollars and per cent, 1918 over 1916.

TABLE IIIA

	1916	1918	Increase	Per cent of Increase
Labor				
A	$2,444.00	$3,120.00	$676.00	27.7
B	1,664.00	2,080.00	416.00	25.0
C	1,860.00	2,132.00	272.00	14.6
D	3,744.00	5,340.00	1,596.00	42.0
E	4,732.00	5,420.00	688.00	14.5
	$14,444.00	$18,092.00	$3,648.00	25.2
Coal				
A	$2.775.00	$6,379.00	$3,604.00	130.0
B	1,800.00	2,700.00	900.00	50.0
C	1,833.00	3,125.00	1,292.00	70.4
D	8,100.00	14,040.00	5,940.00	73.7
E	6,262.00	10.800.00	4,538.00	72.4
	$20,770.00	$37,044.00	$16,274.00	78.3
Combined.......	$35,214.00	$55,136.00	$19,922.00	57.0

TABLE IV

Costs and Rates in Cents Per Kilowatt-Hour

	Operating	Competitive	Central Station	Gain or Loss in Cents Per Kw-Hr.
A 1916	17.8	5.2	5.81	Loss.... .61
1918	28.8	11.6	5.66	Gain.... 5.94
B 1916	9.26	7.19	5.5	Gain.... 1.69
1918	12.45	9.39	5.5	Gain.... 3.89
C 1916	9.5	4.94	5.5	Loss.... .56
1918	13.5	6.85	5.5	Gain.... 1.35
D 1916	14.56	3.083	4.75	Loss.... 1.667
1918	22.71	6.845	4.75	Gain.... 2.095
E 1916	4.83	2.71	4.04	Loss.... 1.32
1918	7.31	4.66	4.04	Gain.... .62

This table was compiled principally for the purpose of showing the gain or loss in cents per kilowatt-hour if current had been purchased during the years of 1916 and 1918 under the prevailing conditions.

The competitive figure is the total operating expense minus the estimated cost of heating, and is assumed to represent the rate the customer could afford to pay, the installation being of such a character as to permit of connection to central station service without change.

The figures in the Central Station column represent the prevailing rates of the companies in the respective field. The difference in the rates of case "A" is due to kilowatt-hour difference. The rates of 1916 were in effect during 1918.

Table IV suggests Table V, that is, by what sum of money should the central station increase or decrease its rates to meet competition? The individual cases are here analyzed.

TABLE V

	Dollars 1916	Dollars 1918	Percentage 1916	Percentage 1918
A	Dec. $196.79	Inc. $2,138.81	Dec. 10.6	Inc. 104.0
B	Inc. 657.00	Inc. 1,540.00	Inc. 29.6	Inc. 69.4
C	Dec. 231.20	Inc. 571.00	Dec. 10.0	Inc. 24.5
D	Dec. 1,667.00	Inc. 2,095.00	Dec. 35.0	Inc. 44.0
E	Dec. 3,183.30	Inc. 1,481.60	Dec. 32.9	Inc. 15.3
	Dec. $4,621.29	Inc. $7,826.41	Dec. 22.2	Inc. 37.3

The values in Table V illustrate the desired point, namely, that the central station, to obtain all 1916 business of the five cases at competitive rates, could have increased the rate for case "B," but would have had to decrease rates materially to meet the costs of other cases; whereas, to obtain 1918 business, it could have made a very substanial increase in rates. Fig. No. 1 is a plot of the data of the several tables.

To determine the advisability of subdividing all business

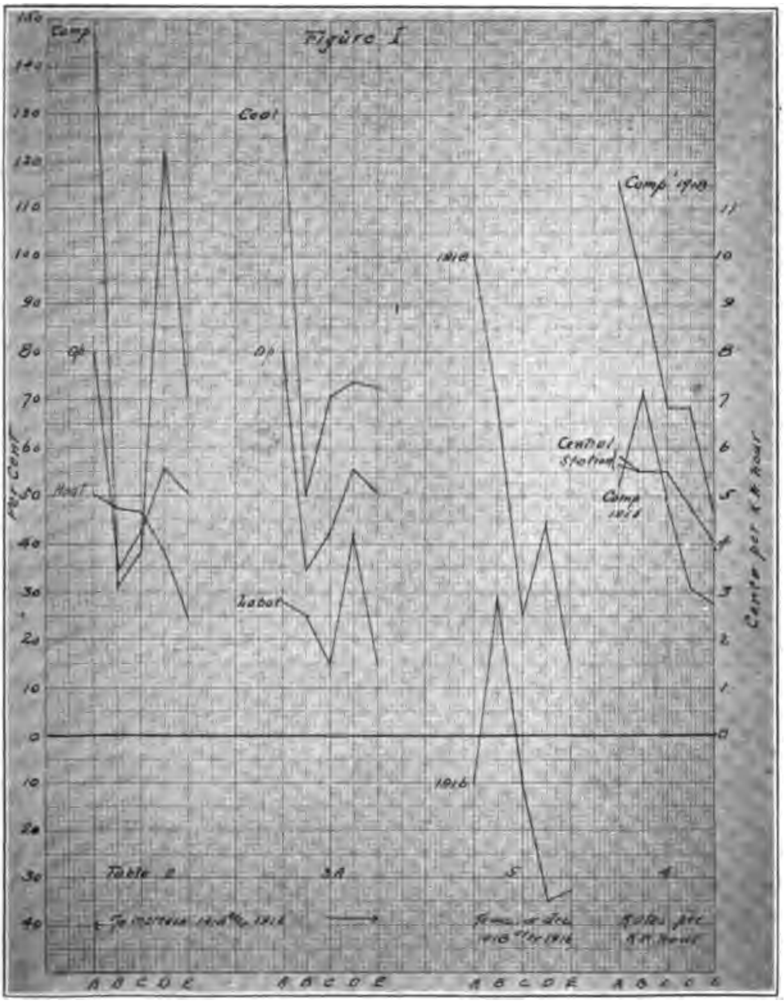


Fig. 1.

into groups which might be known as "Rate Year Groups" the following theoretical plot, Fig. 2, has been prepared.

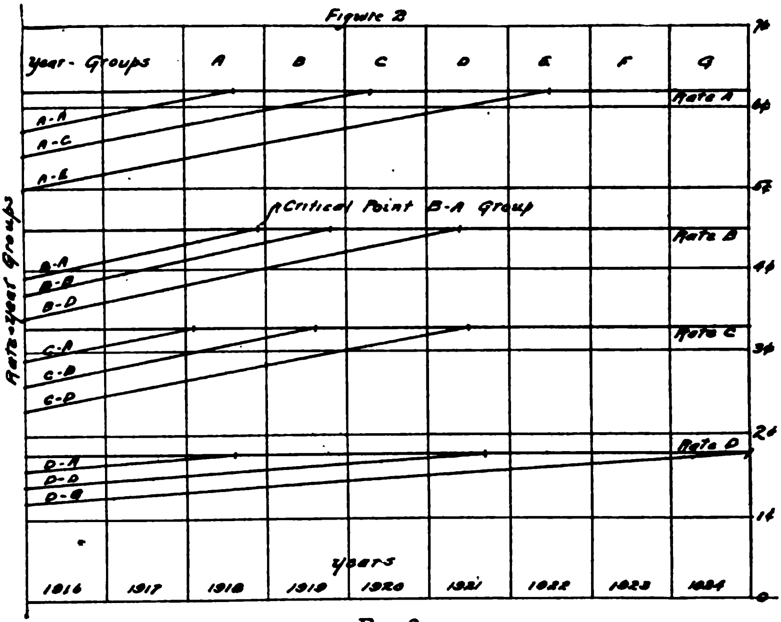


FIG. 2

The years have been plotted against the rate per kilowatt-hour. Four rates for central station service have been assumed as constant for the years 1916 to 1924 inclusive, namely, Rate "A" at 6.2c., Rate "B" at 4.5c., Rate "C" at 3.3c., and Rate "D" at 1.8c.

Lines "A-A" to "D-G" inclusive have been drawn showing arbitrarily assumed cost tendencies of isolated plants by years.

The year of 1918 has been assumed as the "A" year group, 1919 as the "B" group and so on.

The point taken as a means of classifying the various cases into groups is the "Critical Cost Point." Thus any individual case crossing the central station line during the year of 1918 would be classed in the "A" group regardless of the capacity, etc. The "critical cost point" in relation to the "time element" determines the status of each case with reference to its business-getting possibility.

The "A" groups, being all the cases reaching the critical cost line during 1918, should be further classified into groups according to the rate they could earn. Thus, year "A" groups crossing Rate "A" would be classified as Rate-Year "A-A" groups, etc., etc.

No reference has been made to the fixed charges, as reliable data are not available. Further study will probably show that although no items have been added to the list of fixed charges, the values will be higher in old, and in new, plants for the following reasons:

First.—The employment of inefficient and indifferent labor during the war period, with its consequent inattention to repairs and maintenance, will shorten the useful life of the plant.

Second.—Plants were overloaded and operated under overloaded conditions for an extended period of time, thereby reducing the useful life.

Third.—The quality of oil and materials used was of a lower grade than heretofore. The effect will be to shorten the life of the plant as well as to increase the cost of repairs and renewals.

Fourth.—Plants reconstructed, added to or new, will be subject to higher fixed charges due to the higher investments and costs of 1918 as compared with 1916.

Fifth.—All plants were subjected to higher insurance charges.

If an investigation of the character outlined herein were instituted by any company, and continued over a period of years, it would be able to determine the curve of costs and cost tendencies of isolated plants.

Were we in possession of the data of a large number of cases, analyzed in accordance with the foregoing method, we would find it feasible to classify isolated plant business into groups measured in terms of business-getting possibilities. This grouping should take into consideration the time element, that is, the probable date when, due to the increasing isolated plant costs and the decreasing central station charges, the group is changed from a group of future prospects to a group of immediate business-getting possibilities, regardless of the class of business to which each prospect may belong, the capacity of the plant or the form of contract applicable thereto. Thereby, the selective method of obtaining isolated plant business would be carried to its logical conclusion.

Had there been no war, it is probable that by this time considerable isolated plant business would have come within the scope of central station operation. As a result of the war we have been placed in an advantageous position.

Plant costs have materially advanced, whereas central station rates have been practically constant. The point of contact between these competitive elements has been reached and passed and is now in favor of central stations. This point of contact might well be termed the "critical cost point."

The success in developing isolated plant business will be governed by the extent to which all the forces in our possession are coordinated, including a more intimate knowledge of present costs and their relation to the past, with a possible insight into the future, the efficiency and enthusiasm of the sales force, the nature and the timeliness of advertising matter. It will also include the proper selection of business at or beyond the critical cost point.

The continuous accumulation of adequate and reliable cost data as a means of determining the critical cost point could be made of inestimable value to the sales force.

"The clever man," Professor Fisher says, "is not the man who waits, but the one who finds out the new price facts and acts accordingly."

MR. JONES: You have heard Mr. Meyer's paper, which has brought out some very important points. The whole matter is now before you and is open for discussion. There are many points we can take up to advantage.

STEPHEN BENNIS, New York City: In looking over Mr. Meyer's paper, there are certain points that impress me very much, and being familiar with the isolated plant business, I will speak a few minutes on the subject.

Referring to page 249, the plant owners are further handicapped in cutting down the quality and quantity of the service by their bad voltage regulations. A decrease of voltage produces a decreased efficiency of lamps, causing a loss of light which is considerably greater than the reduction of the monthly consumption on a meter proposition.

On page 249 the increased capacity tied up or the equivalent money tied up, will necessarily be taken from the work for which that plant was designed primarily, resulting in a decrease of the main business issue. The function of the business is, say, shoemaking, woodworking or what not, and not power production, which is the central station's business and should remain such. The other business should also remain shoemaking or woodworking and not producing power. Therefore you see that the plant or business is diverting from the main issue to another issue which is secondary, resulting in an inefficient system.

The executive's time given to isolated plants must be taken from the other work for which he was employed and in which he is most efficient—the work on which the dividends of the concern depend.

In Table I, which gives the relative operating expense for the years 1916-1918, you will notice that the change from a profit to a loss, so far as the central station is concerned, depended entirely upon the exhaust steam used for heating. This was therefore a credit to the isolated plant account. Now the question comes as to the immediate business-getting possibilities, and one will naturally say, the number of plants using exhaust steam is a minimum. If we could have eliminated the heating credit of the exhaust steam in the isolated plants, a saving could have been made in favor of central station service of $1922.70 in 1916 and $7,825.60 in 1918.

In Table III, you will note that labor does not increase as rapidly as coal. Coal increased 78 per cent and labor only 25 per cent.

Table V gives the average values of the percentages, increases and decreases of rates in 1916 and 1918, to meet competition. You will note that the table shows a decrease in rates of 22 per cent in 1916 and an increase in rates of 37 per cent in 1918.

Now the question is, how much could we increase the rates at the present time. It looks to me as though we are in a position to increase 15 per cent under existing conditions. It is simply a question of policy as to whether we should make an increase in rates, or whether this margin should be retained to favor central station service if there is a heating proposition concerned.

The central station rates have continually decreased while the isolated plant costs have increased, and it is a question how the change will follow, or will it take the cycle as suggested by the author of the paper.

The ice and refrigerating business may be regarded as the best immediate business-getting possibility as it requires no exhaust steam, and therefore is the first class of business that should be immediately sought. Also this business has a better load factor than any of the others, being a 24-hour constant load. Another point in favor of this latter business is that the cost of power is a large percentage of the total cost of the finished product, amounting to about 25 per cent, whereas in the average plants in the other class it is about 2 and 5 per cent.

I endorse Mr. Meyer's suggestion that we should keep accurate data concerning plant operation, and help as much as possible to have the isolated plant operators keep them in order to see for themselves their operating conditions. The average isolated plant does not keep any log or data and therefore the power production costs are more or less guesswork. If they could see the true conditions, central station service would appeal to them strongly. We must educate them.

The paper throughout shows considerable thought and study, and it will do us all good to give it our consideration.

R. H. Knowlton, Philadelphia: Two points occurred to me in reading this paper and listening to the previous speaker's remarks. One is the unfortunate fact that the class of plants selected for comparison is the small plants, namely, those requiring from 32,000 kw-hr. per year to 240,000 kw-hr. per year. In my experience the power business in this class of plants is not competitive business; that is, our rates for such prospects are not fixed by isolated plant competition but rather by franchise or by a regulatory body and if not by either of these two things, then by consideration of public policy. It may be true that the plants requiring from 2,000,000 kw-hr. to 10,000,000 kw-hr. per year have suffered the same percentage of increase in costs as have those treated in the paper, but I think the paper would be of more value had it included a wider range of power requirements.

The previous speaker stated that the ice plant is a good power prospect because the cost of power represents as much as 25 per cent of the total cost of manufacture. My experience makes me diametrically opposed to this idea, because I have found the best power prospects to be those industries in which the cost of power is a small percentage of the total value of the product f.o.b. shipping platform, since I would rather not be forced into too close competition with the isolated plant, thus being able to dwell more largely on the intangible and psychological advantages of purchased power. I desire first to get the prospect in a frame of mind where he is anxious to be relieved of any responsibility that he can get someone else to shoulder for him. Power is one of them. If in a plant where power cost is but 5 per cent of the total cost, I can come within 10 per cent of meeting isolated plant competition, I have come within 0.5 per cent of meeting isolated plant costs when the total costs of manufacture are considered. On that basis there is a strong possibility of convincing the prospect that the difference is too slight to engage his serious consideration, there being so many larger items of cost to study that give promise of larger reward.

M. S. Seelman, Jr., Brooklyn: There is no question but that the figures furnished by Mr. Meyer may be of some service to us in meeting this very important and somewhat vexatious problem during the balance of this year; but I am impressed, from such experience and from such foresight as I may possess, with the fact that this question is, as somebody said of the tariff, largely a local issue. While it may be true in the main that, as Mr. Meyer stated, the rate for power has remained during the last two years more or less stationary, there are unquestionably many companies, many communities, where the rate has been materially increased, especially to large power consumers.

Now, the acute situation, as it presents itself in those communities or to those companies, applies not only in the matter of obtaining new business from isolated plants, but in the matter of renewing contracts that may terminate during the coming year. What is the correct basis on which we may renew them? What is the competitive basis on which we may get new business? Can we continue now after the war is over on the basis that we have been operating under for the past year, we will say, where our rates for power have been materially increased? In the company I am connected with, during the next six or eight months, contracts for about 25 of our largest customers will be terminated. These are very important contracts. Since they were signed power rates have been materially increased. The question is, when we come to renew these contracts this year, can we do it at an increase of 25 per cent, 30 per cent or 40 per cent over old rates, or are we going to be obliged to drop somewhat our rates again? Are our present rates competitive? Isn't that in the main a local question? Of course, we can get great help from a discussion of this kind, and I, for one, came here hoping that I could learn something to help solve the problem. But I am satisfied that after all we must, each one of us, take this up in our own company and community and figure it out for ourselves, so that, when we come to make new contracts, we will know where we stand.

MORSE DELLPLAIN, Hammond, Ind.: I am very glad Mr. Seelman brought out that point, because the greatest value we can get from this discussion is to have our mental attitude changed on the subject of isolated plant costs. In the past the average power salesman has been much worried because he could not meet these costs. He has invariably come to his manager with the story that the power prospect could make his own current for figures all the way from three-quarters of a cent to a cent and a quarter per kilowatt-hour.

Now, however, costs have gone up. They have gone up all the way from 25 to 100 per cent, and we will have to change our mental attitude in approaching this class of prospect. I do not believe that isolated plant costs are ever going to be what they have been, and it seems we can profitably change our mental attitude from the basis of one cent per kilowatt-hour to two cents per kilowatt-hour.

My suggestion in connection with Mr. Seelman's inquiry is that, whereas we possibly cannot hold on to the entire amount of the surcharge which some of us have been allowed, we can at least hold on to a good percentage of it.

There has never been a time when it was easier to sell power than in the last year. The prospect has gotten into the habit of thinking of purchasing energy rather than making it. Heretofore, it has been a case of the prospect deciding first to make his own power, but if our power salesman was on the job early enough, the prospect's idea could be changed. Now, however, the prospect decides in the beginning to buy his power, and if he cannot get it at a price within reason, he decides to install an isolated plant. Let us get that psychological condition clearly in our minds. Let us carry the thought home and make up our minds that we can sell our power for just a little more than the prospect can make it for.

CHAIRMAN JONES: Is there any further discussion?

MR. MEYER: In my discussion on this important subject I was careful to state that each case should be considered on its own merits and that this was also true of cities; for instance, the cost tendency in the City of New York will differ from that prevailing in our Western cities.

The discussion was intended to show that the condition of rising prices is prevalent and that central stations should at this time give full consideration to this condition.

The question of selling electric service to isolated plants at a rate higher than the competitive rate is a matter of salesmanship and introduces the element of psychology.

In this study I did not consider the psychology of salesmanship. I believe that one of the principal reasons why it is necessary to sell power at the present low rate is because of the fact that we do not know true isolated plant costs. If this is so, then the sooner we know what are the true costs, the sooner we will be in a position to increase substantially our revenue from this source of business.

The discussion presents a reasonably definite basis for determining the critical cost point. A study of the suggested hypothetical year rate groupings develops the fact that regardless of our present method of classifying business into normal classification groups, we will find it feasible to develop a more logical grouping. To illustrate the point. Classes of business automatically group themselves around the rate to which they are entitled, and this is true irrespective of the nature of their product. Thus, we find a machine shop, having an installation of 20 kilowatt demand and a load factor of 30 per cent in the same rate class as the bakery having the same characteristics. Both classes of business, under like conditions, are equally desirable.

There is a second element, year rate grouping, that is, the groups in the year in which these individual cases reach the critical cost point.

We make an unsuccessful attempt to negotiate a contract, the main reason for the failure being the difference in the cost of operation represented by the relative rates, that is, the production rate by the isolated plant owner and the central station rate.

When will the cost of isolated plant operation so increase and the central station rates so decrease as to reach the critical cost point and thereby convert the prospective group to the business-getting possibility?

With a knowledge of the rate grouping, regardless of the manufacturing classification, and a further knowledge of the cost tendencies, we arrive at a somewhat different method of directing the efforts of the sales force. It is quite true that the gap between the central station rate and isolated plant cost may be bridged by the salesman, but the important point is, what means are at present available to determine the point of contact after the case has been unsuccessfully concluded or even before the case is referred to the salesman?

I believe if this plan were adopted we will have reached the ideal of intensive business-getting so far as it relates to the directing of the sales force; further, that a case would be assigned to salesmen when it has reached the critical cost point or at least as near that point as will, with the assistance of psychology, justify attempting to negotiate the business.

Plant costs have increased and I believe they will go higher because the two influencing factors, labor and coal, have that tendency. To some extent this advance in labor and coal prices will be offset by higher operating efficiency, but to only a very small degree.

The subject deserves very careful study by the Isolated Plant Division Committee and it is hoped that this Committee will undertake to lay before the industry a detailed working plan, that we may obtain our share of business while the getting is good.

Mr. Lundgaard. Without attempting to go into this subject in detail, I want to say that I have enjoyed the discussion and I hope you have all enjoyed it with me. There are three and one-half million kilowatts of isolated plant capacity throughout this country. Gentlemen, I think the time is near at hand when we can have it all. The paper and the discussion have served two purposes, one in giving us an inspiration to take with us and one in indicating the scope of the work of the Isolated Plant Division, of which I am the retiring chairman. Before leaving the platform, I want to make the plea that you cooperate in the work of this Division more heartily than has been the case in the past.

Chairman Jones: During the year there has been an important change in the organization of the Power Sales Bureau as the Industrial Heating Bureau has been merged with it. Previously the Power Sales Bureau had handled the matter of electric heating as applied to the electric steel furnace field, whereas the other branches of electric heating were handled by the Industrial Electric Heating Bureau. Under the new arrangement, the entire field of electric heating will be covered by the Power Sales Bureau.

The Industrial Heating Bureau prepared for presentation at the convention which was abandoned on account of the war an important report compiled by Dr. Hirschfeld. (See page 122, Commercial Volume, 1917 Proceedings.) This report contained much valuable information and we have asked Dr. Hirschfeld to review it for us.

ELECTRIC HEATING IN NON-FERROUS METALLURGY

By C. F. Hirschfeld

I want to call your attention first to the fact that this report was prepared early in 1917, and the world has moved in many respects since then. Some of the things which at that time were predictions are now realities. Since the preparation of this report, I have had very little to do with this particular field. I have been busy making guns and ammunition, and I know little of the development of electric heating beyond the time at which this report was written. Therefore, I may not be able to answer questions if they relate to development during the past two years.

Please note also that the paper is not supposed to be original; it is merely compilation. At the time this material was prepared, we felt that the industry, or that part of it interested in this particular field, was entering upon a new line of endeavor, and that if we could collect that which was interesting and the available facts and figures, we should serve a useful purpose. I think we have given credit to all authorities whose work we included; if we did not do so, the omission was unintentional.

The report starts out by reviewing rather briefly one of the arguments which was used in the early days of the electric heating science to prove that, at least for industrial purposes, the higher the temperature of the process the greater the chance for introducing electric heating. In this connection, there are given certain theoretical curves to show the highest theoretical thermal efficiencies attainable in processes conducted by combustion heating. These curves have been worked out for several characteristic fuels, and all show decreasing efficiency with increasing temperature. There is, of course, nothing new about this, but it was felt that the curves might prove useful. On each curve are given certain critical metallurgical temperatures so that one can determine by inspection the normal thermal efficiency in a combustion process when dealing with any particular metal, such as brass, copper, tin or steel.

Following this review, there is a brief outline of the facts which make it economically possible for electric heating to compete with combustion heating in comparatively low temperature fields, despite the relatively high efficiency obtainable with combustion under these conditions.

The paper then turns to a consideration of what was being done in the application of electric heating to non-ferrous metallurgy at the time it was written and discusses what might be done in the way of the reduction of the ores of non-ferrous metals, the melting of non-ferrous metals, and the making and melting of non-ferrous alloys.

Following this there is a very complete bibliography, including not only articles covering the use of electricity in these processes, but also articles which, because of the method of treatment or the subject considered, should be read by an individual attempting to become familiar with the field in general in order that he might apply electricity to it.

At the end of the report are given some elaborate tables in which are collected all of the relative physical constants for the pure metals, such as the specific heats of the solids, liquids and vapors, the heat of fusion and the heat of vaporization, and a number of others. These are all expressed in different units, so that if you are working in ordinary fahrenheit units and B.t.u., or if you are working in centigrade units and B.t.u., or if you are working in electrical units, you will find appropriate values given.

I should call attention to the fact that these physical units are not completely determined, and in many cases the values given in the report are calculated. These calculations were made by means of certain formulae used by chemists and metallurgists, and the resultant values must be regarded as approximate. Despite this fact they do serve to give you a fairly exact knowledge of what a certain constant would be if it had been determined. In each case where the value of the constant has been calculated, that fact has been indicated.

I do not believe that it is necessary to go through the various parts of this report in any greater detail, but I do want to call your particular attention to one section of it. At the time the report was prepared, there was a well recognized demand through a very large portion of the country for a successful brass furnace, and part of the report is given over to a rather lengthy discussion of that type of furnace. We tried to attack the problem rationally by considering the conditions to be met by brass furnaces, and then considering the types of furnaces which had been suggested or actually sold for use in the brass industry. We attempted to analyze the different types of furnace and to indicate their strong points and their weak points when considered for use in connection with brass making and melting.

I think that this discussion of the brass problem is one of the most important things in the report. Curves which are given in this section show the problems to be met, and the discussion of the types of furnaces which were claimed to be available for the melting of brass is based largely upon the facts brought out by these curves. It is particularly important to note that the problems to be met in the brass field are of numerous different kinds. For example, one might make brass by using virgin metals; one might make brass by using scrap, either lump or turnings and chips, the scrap being all brass to begin with and simply being assembled in such proportions as to give the desired mixture when melted; or one might make brass by an intermediate method, using part virgin metal and part scrap. Every time you change these conditions, you change the characteristics of your problem. A furnace which will satisfactorily melt virgin metal and make brass may not satisfactorily melt scrap of fine size. If it does melt scrap of a fine size, it may not necessarily melt virgin metal and make brass of it. Or a furnace which will make brass of scrap with certain additions of virgin metal may not make brass satisfactorily with certain additions of other virgin metal. It is very, very necessary, I think, that we should not generalize when we speak of the performance of a brass furnace, particularly when we speak of a brass furnace of a particular type as being sucessful or not successful. We should determine and state the conditions under which the furnace is used when we make statements of this type.

H. A. WINNE, Schenectady, N. Y.*: There is one point brought out in the report that I think deserves especial emphasis, and that is that as a general rule electric heating cannot be

* Written discussion.

economically applied to existing fuel heated installations without change in either the general design of the oven itself, or in the cycle of operation, or both. Too often the oven user expects merely to place some electric heaters in a poorly insulated box type oven, and thereby get the results that can be obtained only with a well insulated, continuous type oven. Then another operator considering electrification will express himself as perfectly willing to insulate his oven; but on investigation it may develop that he expects to place a layer of insulating brick *outside* his oven walls of nine inches of fire brick, with all their heat absorption capacity.

The matter of heat insulation and of proper design of the oven and the operating cycle to conserve heat is of much more importance from an economic viewpoint in an electrically heated oven than in fuel heated apparatus. On the basis of total available heat units in the fuel, with electric power at 1 cent per kilowatt-hour, coal at $5.00 per ton, fuel oil at 7 cents per gallon, coal gas at 70 cents per thousand cu. ft. and natural gas at 30 cents per thousand cu. ft., the cost per B.t.u. is for electricity approximately sixteen times as great as for coal, five times as great as for fuel oil, 2.5 times as great as for coal gas, and 11 times as great as for natural gas. From this it is evident that a much greater expenditure for insulation and other heat conserving features, is justifiable in an electrically heated installation, than in one that is heated by fuel.

Mr. Jones: The first half of the next paper is on the same general topic, and we will go ahead with that. The next paper for discussion is Section A of the paper on Electric Furnaces, Non-Ferrous Metals. The discussion will be led by Mr. Wilcox.

N. T. Wilcox, Keokuk: I see that the program includes a paper on this subject. Well, all the paper we have is blank. But we have in mind a discussion by a few people who have had some experience, particularly in the melting of brass. You know we have in the past come up against the proposition on the part of the customer that it costs too much for electricity, but at present we have reached the point where the customer is not looking at the price as much as at the work done. I don't think we can spend very much time on this subject, as the time available is very short, so I must ask Mr. Noyes, who has had a chance to observe the operation of brass furnaces, particularly in Detroit, to give us a short discussion from the central station standpoint.

CHAIRMAN JONES: Mr. Noyes.

ELECTRIC FURNACES

BY J. D. NOYES

Nineteen electric furnaces for melting non-ferrous metals are now in operation upon The Detroit Edison Company's power lines. The total furnace transformer capacity supplying these units is 4335 kv-a.

In addition to the above furnaces already in operation there are four furnaces now on order, with a total transformer capacity of 1200 kv-a. One rolling mill has just started an experimental furnace which if satisfactory (and the tests so far look well) will be followed by eighteen or twenty others with a transformer capacity of over 5000 kv-a.

Practically all of the above load was added in 1918, although previous to that time a great deal of development and of experimental work was carried on, the progress of which has been covered by reports in the technical press, and before this and other organizations.

These furnace installations are all supplied with power under the regular form of Detroit Edison Company primary contract covering the sale of 4600 volt, 3 phase, 60 cycle power in blocks of 100 kilowatts and above. The rate is as follows:

First 200 kw. of demand..................$3.00 per month
All over 200 kw. of demand........'.......$1.25 per month
First 100,000 kw-hr. 8/10c.
All over 100,000 kw-hr. 7/10c.
Less 5% discount for payment in 10 days

The customer installs his own transformers, high tension wiring and oil switch, according to plans furnished without charge by The Detroit Edison Company, which company supervises the construction to see that the plans are followed. The design of these primary sub-stations has been well standardized in our territory, and it has only been necessary to modify the general lay-out in some details to take care of almost any kind of a furnace installation, whether for steel or non-ferrous metals. The important feature of this primary sub-station plan is that we retain and exercise supervision over all the high tension apparatus connected to our system, and require that it be installed in a way that we consider satisfactory and in accordance with our standard practice.

The nineteen electric furnaces now operating on non-ferrous metals are installed in ten industrial plants of our territory. Some of the installations consist of single furnaces, as would be used in a relatively small foundry, but a number of the plants have two or more furnaces. The largest installation is in a smelting works which is operating eight units. This plant also uses a variety of fuel fired furnaces on different classes of work.

In most cases the electric furnaces are supplied with power through the same primary meter that carries the general power load, but in several installations the furnaces take all or almost all of the power supplied. The following data are taken from three such plants as illustrating what might be considered typical electric brass melting furnace loads. In each case incidental power and lighting are included, so that the figure called "average over-all kw-hr. per ton" is higher than is required by the furnaces alone and should not be confused with the latter value as it is usually given by the furnace builders.

Plant No. 1.

Furnaces: Two—Detroit Electric Furnace Company—2000 lbs. rated capacity.

Furnace Transformers: Two, 300 kv-a. single phase, one for each furnace connected, one on each of two phases of the 3-phase line.

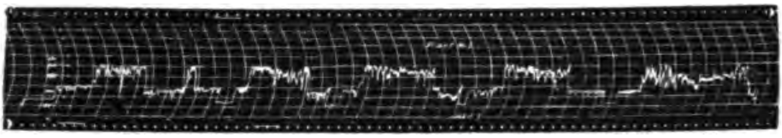
Current Consumption

Monthly	Average Demand K.W.	Working Hrs. Per Week	Tons Melted
36,720	150	55	
70,530	250	113	
92,610	274	144	835.2
85,470	274	152	
78,930	300	55	
110,280	370	56	
474,540			

Average rate earned 1.6c per kw-hr.

Average over-all kw-hr. per ton 570.

Curve-drawing watt-meter record No. 1 shows the load at this plant when operating on a 10-hour-a-day basis.



CURVE-DRAWING WATT-HOUR METER RECORD No 1.

Plant No: 2.

Furnaces: Three—Detroit Electric Furnace Company—2000 lb. furnaces.

Furnace Transformers: One 300 kv-a. unit for each furnace.

CURRENT CONSUMPTION

Monthly	Average Demand K.W.	Working Hrs. Per Week	Tons Melted
161,460	320	150	1575
147,270	322		
135,210	365	115	
159,270	443	115	
207,990	482	115	
245,670	525	109	
1,056,870			

Average rate 1.25c. per kw-hr.

Average over-all kw-hr. per ton, 670.

Plant No. 3.

Furnaces: Four Detroit Electric Furnace Company units.

Furnaces: Four Electric Furnace Company units.

Furnace Transformers: 1620 kv-a. total.

CURRENT CONSUMPTION

Monthly	Average Demand K.W.	Working Hrs. Per Week	Tons Melted
170,100	296	55	
270,540	710	168	
261,180	740	168	420.4
247,740	740	168	
272,280	740	60	
163,740	876	125	
1,385,580			

Average rate earned 1.1c per kw-hr.

Average over-all kw-hr. per ton 332.

Curve-drawing watt-meter record No. 2 is from this plant.

CURVE-DRAWING WATT-HOUR METER RECORD NO. 2

In considering the above data it should be remembered that there are many factors preventing the establishment of average figures that have anything more than illustrative value. The application is new and none of the plants can be said to have established routine operation. The particular alloy being worked and the use to which it is put are of great importance in the consideration of a given problem. For example, Plant No. 1 has been melting an alloy high in copper and pouring it very hot into castings of thin section, a job that requires more heat and therefore more kilowatt-hours per ton than is taken by Plant No. 3 where miscellaneous scrap is melted and poured into ingot.

Most electric brass furnaces are single phase units, but as they are of relatively small capacity, and are generally used in several units that can be balanced across the phases, they will not cause any trouble on any but the smallest power lines. In Detroit our power distribution from the sub-station is kept separate from the lighting circuits and, the lines having a capacity of some 3000 kv-a. each, the furnace load, even of the arc type is not objectionable. We would be doubtful of the advisability of trying to carry any arc furnace load on the same feeders with incandescent lighting, where close regulation was expected by other customers. However, our primary power customers always take their factory lighting off their own primary sub-station bus without serious inconvenience. The power factor of the furnace loads is as good or better than will be found in the average induction motor driven factory.

Our electric brass melting load now in operation will use from ten to twelve million kilowatt-hours per year, under normal conditions of operation, and if pushed for output would increase this consumption 25 to 50 per cent.

There is immediate business in sight which should more than double this load within the next year. The users of the furnaces are without exception well satisfied with their performance, as is evidenced by the fact that a trial installation has, wherever the capacity demanded it, been followed by the purchase of additional units. The development of the last year has placed the melting of non-ferrous metals by electric power safely within the field of central station activity, and in our territory we regard the "elimination of the crucible" and the fuel fired furnace as certain to occur in the very near future.

Mr. Wilcox: I think we are all thankful to Mr. Noyes for this little resumé of what he has been doing in Detroit. Mr. Crosby of the Detroit Electric Furnace Company is here, and if he will give us just a little talk on this we will be very grateful.

E. L. Crosby: It is only in the past year that I have emerged from the position of a central station man to that of an electric furnace manufacturer, so I feel rather peculiar in talking before this body from the standpoint of the manufacturer rather than of the power salesman. In the application of the electric furnace to brass melting and brass making, we have learned a great many things in the past year. I believe this development of electric furnaces generally has been put up to the user rather than to the central station. The central station has shown very little interest in the development of electric furnaces, especially brass melting furnaces, until very recently. The question of the rate per kilowatt-hour is of such comparatively little consequence to the brass melter that it ought to be easy to get very much more business through electric brass melting than with the electric steel furnace. For instance, we have in Detroit the plant about which Mr. Noyes has just spoken to you, where three furnaces are installed, and in which it is figured that the saving in net metallic loss alone retires the investment including the cost of the furnace and cost of construction every ninety days. Now, that chap does not worry much about the price of kilowatt-hours. He says, "If we pay for this furnace within 60 or 90 days why should we worry, when by increased power consumption we are increasing the production 25 to 30 per cent?"

I wish to object to Mr. Noyes' method of stating kilowatt-hours over-all. That gives you absolutely no basis for computation. For instance, he mentioned the over-all consumption of a foundry. I believe that foundry has no machine shop connected with it, and does very little machine work. If they had taken that way of figuring they might have considered that the power was all used by the furnace and would have thought the furnace was no good. Let us consider the consumption in a plant of a different type, where nothing is done in the way of machining, but as a matter of fact, there is everything in the plant in the way of equipment for concentrating, a die casting shop and things of that kind. While no machine work is done, the plant does quite a lot of work in metal recovery, which requires a large amount of power. This power should not be charged to electric furnace operation as it is entirely foreign to that department.

As to the actual current consumption that Professor Hirschfield brought out, this matter is of the utmost importance. It is easy enough to say glibly that an electric furnace for brass will consume so many kilowatt-hours per ton. We have averaged up the proposition and reached the figures 180 to 300 kw-hrs. per ton. Someone says, "I understood you to say it would be about 225." The reason for the wide range in current consumption is the variation in character of charge and temperature of pouring same.

For instance, the Aluminum Casting Company, Detroit, pours very small castings at a temperature of approximately 2300 degrees. That obviously takes a great many more kilowatt-hours per ton than a plant making castings of large cross section. Also, a plant remelting ingot or clean scrap will take much less current per ton than a plant melting dirty oily scrap or borings or things of that sort.

So in making statements to brass manufacturers, it is quite necessary that the man doing the talking should have considerable information on foundry practice. For example, we have furnaces installed in a rolling mill in the East. There are four furnaces in one plant, melting 60/40 brass and their average consumption is 210 kilowatt-hours per ton. Another plant in Detroit melting 60/40 brass takes 250 kilowatt hours per ton. The difference is due to the physical character of the charge, and the temperature of the metal poured. It makes a difference whether you are melting brass scrap or copper ingots and virgin spelter or whether you are remelting in the one case the 60/40 ingots or 60/40 scrap. In making brass the virgin spelter combining with the copper gives off a lot of heat in melting which results in very materially reducing the power consumption.

I believe the brass-melting field today is a good field, and as regards quantity, I think that while today there are probably 75 brass furnaces in operation, not over 1 per cent of the brass is being melted electrically. There is no reason why 80 per cent of it should not be so melted. In fact, that is a very conservative figure, and the melting can be done with very great saving when one takes into consideration the factors I have mentioned. Crucibles, which used to cost in 1914 \$2 to \$3 per ton of melted metal, during the last year averaged \$12 or \$14 a ton. When one considers that electric melting of metal under similar conditions can be done for less than \$10 a ton, it does not leave much argument, and the superiority of the quality, the control of the homogeneity of the metal and the temperature control, which is very essential in brass, can be obtained in no other way, and are very easily and readily obtained in our electric furnace.

Mr. Wilcox: We have another type of furnace that is interesting and those who have been following this subject will be very much interested in it; I believe Mr. Collins of the General Electric Company is here, and he will tell us a little something about that and some of his experiences.

E. F. Collins, Schenectady, N. Y.: I am going to touch on just a few points in general. These points of information which I shall offer, of course, have been obtained largely from the muffled arc type of furnace which I have had tested and in practical operation. First I want to touch on that point which covers rates. I believe rates, and, of course, kilowatt-hour consumption, affect the application of the electric furnace to the melting of non-ferrous metals, but I am going to give a few specific instances to show that the questions of rates and kilowatt-hour consumption are about the last questions to be considered.

In other words, there are a great many things to be considered with specific processes, and usually the question of whether you should use, and can use economically, the electric furnace for the process has been determined before you get to the rate proposition.

Take the lower melting temperature metals; take tin, for instance. The electric furnace can easily show advantages in the melting of tin. The making of tin plate requires very close control; as instanced by one manufacturer who requires a control of 1½ degrees on his tinning bath out of a matter of 600 degrees. In that case control answers the question. Take the case of melting zinc or spelter; that is, putting your electrolytic plate, if you please, into pig. The fuel fired furnace in some of the best refineries has a dross and oxidation loss of 6 per cent to 8 per cent. The electric furnace is capable of doing the same work with 2 per cent loss. And it does not matter a great deal in this proposition, where you are consuming perhaps 90 kw-hr. per ton for the process, just what the kw-hr. rates are. You have a wide margin. Take the case of aluminum melting; that is, remelting the aluminum after recovery or for making of castings. It does not matter very much to the man who is making aluminum castings what that rate is (so long as it runs fairly close to prevailing rates), if he gets sound castings, if he is able to put aluminum into his castings or into his cylinder pistons without porosity. Porosity is generally acknowledged to be due to gases in the metal, and while different authorities hold varied opinions as to what those gases are and where they come from, it is generally held by the best authorities to be due to improper heat control, running of too high temperatures locally and creating or generating hydrogen and perhaps other gases, and leaving hydrogen in the metal so that the gas is liberated from the metal in cooling after it is poured, giving a porous structure. It has been demonstrated that non-porous castings can be made in the electric furnace.

Pass now to brass at a little higher temperature. Mr. Crosby has already pointed out to you some of the possibilities there. There is just one other possibility that I have found that he didn't mention, and that is the fact that I have been able to make perfect brass either for castings or for rolling mill work, using electrolytic copper which has not been refined, together with electrolytic zinc which has not been remelted and put into pig. This means at this time a differential of something like $10 per ton.

Coming along to still higher temperatures, take the case of some alloys which we are melting regularly which carry a large percentage of spelters, percentages running up to 30 per cent, pouring at temperatures from 1500 to 1600 degrees cent. We are able to keep in that mixture 30 per cent of spelter with a loss of only 2 per cent. It seems to be the only way in which those mixtures can be uniformly and repeatedly made successfully.

These are only a few of the instances which I might enumerate, showing that there are many things to be considered which have much greater weight than the rate of kilowatt-hour consumption in determining whether one should use the electric furnace for non-ferrous metals.

MR. WILCOX: Mr. Booth of Chicago, who has had a good deal to do with electric furnaces, is here, and possibly he will say something to us that will be of interest.

CARL H. BOOTH: The Booth-Hall Company has just finished building a furnace of an arc type in 250 pound sizes. We feel that the approach to the brass melting field has been entirely in the tonnage furnaces, furnaces melting one ton and half a ton, while the real problem to be solved is the handling in the small brass foundry of the small amount of metal which most foundries use. We studied the different furnaces which have been developed and have decided that from a commercial standpoint, the simplest type of furnace developed was the arc furnace. There are furnaces in use, as you all know, of the resistance type and inductive type, but they also present complicated electrical manufacturing conditions and lining troubles which the brass foundryman is not generally equipped to handle successfully. So, in developing a brass furnace, it occurred to us that the best method was the arc type.

Two days ago we placed in operation in Chicago a 250 pound furnace approximately 3 feet in diameter, of drum construction, like a concrete mixer. This furnace rotates completely, instead of oscillating. In the small sizes the arc is generated between two electrodes, introduced at the axis of the furnace, but when the furnace is built in larger sizes we will probably arrange it so as to use either two or three phase current instead of single phase. These furnaces can run at any reasonable power factor. The power factor of each electric furnace installation, I believe, should vary, depending upon local conditions. Some power companies can use a power factor of 80 per cent, while others require a higher one. We find that 250 pound furnaces will probably average 350 to 400 kilowatt-hours a ton. They can easily turn out a heat in forty minutes. If you wish to hold the heat for a longer period, it will naturally take a little more power. The furnace, in order to rotate entirely instead of oscillating, has had to be arranged with a method for carrying the current into the furnace, not with the usual cable connections, but with the slip ring method of construction. In this case we adopted the third rail shoe type. The track itself, being a specially designed casting, carries the current. We also found it necessary to put the door of the furnace on the end instead of on the circumference. This has been made practicable through a special arrangement of the electrodes, so that the electrodes on one side enter through the door. The door and tap are not on the same side, the tap being on the opposite side from the door.

One of the principal points of advantage in this type of construction is the fact that we are able to make lining repairs with great ease, entering the end of the furnace through the door, and if complete repairs are needed, even taking the end of the furnace off. This has permitted us to build a lining in one piece, much like a crucible. This lining is made of clay brick, and we can insert it very quickly. There are practically no joints to be dealt with as in brick construction.

There are several questions which came up in the construction of this furnace. We believe that outside of the importance of having a small furnace which is rugged and simple, there is a large field open to the brass furnace which can be operated relatively inexpensively, and which does not require automatic regulators for electrodes and other items that greatly increase the cost of construction. When you go into a brass founder's plant and talk to him about $15,000 for a furnace, you immediately put up to him a problem which he does not care to contemplate, and will not consider favorably.

We approach this field believing that the furnace we are now operating will solve the problem of the small electric brass furnace built inexpensively. It does not require a lot of electrical apparatus to operate it, and it is simple, rugged and economical in operation.

MR. WILCOX: It seems that the losses in some of the later types of furnaces, two or three of them, are so small as to be negligible. The other troubles that occurred earlier have been overcome. I think the matter of linings is not particularly serious. I think Mr. Crosby can tell us something more about that. Are there not some gentlemen here who are interested in this subject or who have had some practical experience in it? The floor is open to any who would like to be heard. There is surely some one here who can give us suggestions that would be helpful to everybody. Mr. Collins, has there been any particular difficulty with linings in furnaces of the later types?

MR. COLLINS: I think that in the past probably all furnace manufacturers, to be frank with you, have had trouble, but I believe that through the development of refractories and our increased knowledge as to operating and applying them and handling them in connection with this work, it is coming to a point where the linings are very dependable. At any rate that is so in my case.

MR. WILCOX: Mr. Crosby, what has been your experience?

MR. CROSBY: The question of refractories for electric furnace work has always been a very serious one. It has been overcome, not only by the development of the refractory, but also by the development of the furnace—if you will pardon me a little for advertising my own product. In our type of furnace, which rocks, that part exposed to the arc at one time is the hearth at another time. The refractory is probably never 150 degrees hotter than the bath, which runs from 1800 to 2300 degrees fahr. There are several refractories which work out very satisfactorily and we have used two or three obtained in the open market. Nearly all our customers tell us that a renewal of the lining costs them about $85.00, which does not represent a serious cost.

We have given considerable thought in the last year or so in regard to the introduction of a pyrometer in the furnace. The pyrometer people were not willing to stand back of the idea. They felt that the introduction of a pyrometer was rather difficult, that the results obtained would be undependable, and simultaneously we woke up to the realization of the fact that in the melting of tin and brass the controlling factor is the number of B.t.u. put into it. The answer is an integrating watt hour meter, calibrated so that the operator can read it directly without using a constant. Any one, therefore, using our furnaces, after two or three weeks' time can become efficient enough to bring out a charge of metal of any degree of predetermined temperature within the accuracy of any commercial pyrometer. That is more than can be done in any other method of melting.

Mr. Wilcox: Dr. Hirschfeld, would you like to say anything further on that?

Mr. Hirschfeld: I don't think so.

Mr. Wilcox: All right. We will close the discussion and I think it has been helpful to us all. It simply shows that there is a very large field in manufacturing communities which a central station can go ahead and develop with an assurance that it can make it a success and sell a lot of juice.

H. A. Winne, Schenectady, N. Y.:* I believe that within the next five years we will witness a tremendous increase in the

* Discussion submitted in writing.

use of the electric furnace in brass and bronze manufacture. A well designed electric furnace can produce brass of better quality and, under reasonable power costs, more economically, than the fuel fired furnace.

Probably the two most important reasons for the superiority of the electric alloy furnace over other types are that the temperature may be held within close limits, and that the furnace atmosphere may be made neutral or reducing if desired. Of course these same points are conducive to the success of the electric furnace in other fields, but the importance of temperature control in furnace melting alloys containing zinc cannot be overestimated. This is very well brought out by a study of the curves showing the melting and boiling points of copper-zinc alloys, in Figure 11, of Dr. Hirschfeld's paper in the 1917 Commercial Section Proceedings.

For example, suppose a yellow brass, 70 per cent copper and 30 per cent zinc, is to be made. In order to melt the copper the furnace temperature must be above the melting point of copper, approximately 1085 deg. cent. If the furnace temperature can be held at just about 1100 deg. cent., when the zinc is added there will be very little loss, as the boiling point of the 70-30 mixture is 1150 deg. cent. But if the temperature is allowed to get up to 1150 deg. cent. or a little more, a considerable loss of zinc will result. In a recent test on making 70-30 brass in an electric furnace, when the zinc was added and the alloy poured at a bath temperature of 1100 deg. cent., the metal loss was about 1.6 per cent, whereas when the zinc was added at a bath temperature of 1170 deg. cent., and the alloy poured at 1150 deg. cent., all other conditions being the same as in the first heat, the metal loss totaled almost 6 per cent.

The possibility and practicability of maintaining a neutral or reducing atmosphere in the electric furnace, thereby preventing the oxidation of the alloy, further reduce the metal loss.

The reduction of metal loss by control of the furnace temperature and atmosphere means not only a gain in economy due to the actual value of the metal saved, but permits the composition of the finished metal to be accurately predetermined, an important point when making alloys to close specifications.

Dr. Hirschfeld mentions several different types of electric furnaces used in the copper alloy industry, and remarks that each of them seems to have its own particular field, to which it is best fitted. I want to call attention to the smothered arc type of furnace, which has been under development by the General Electric Company for some time and has only recently been placed on the market. This furnace is probably applicable to a wider field than any other alloy melting furnace on the market. It is at present successfully operating over the range from the melting of aluminum, with an oxidation loss of 1 per cent and less, to the making of a copper-nickel-zinc alloy, requiring a temperature of 1650 degrees cent. This furnace is very advantageous also from the central station viewpoint. It draws a balanced load from a polyphase circuit; it is free from the rapid current fluctuations of the straight arc furnace, its power factor is high; it lends itself readily to automatic control, and it may be operated continuously or intermittently, and so may utilize off-peak power.

CHAIRMAN JONES: We are glad to hear that such progress has been made in the field of electric brass melting. We have been looking forward to this for some time, especially those of us who have spent a considerable amount of money in experimenting along this line. We are particularly gratified to feel that the point has been reached where we will begin to get an income from this class of business.

We are all aware of the wonderful advances made in the electric steel furnace field especially during the period of the war, so that a discussion on this subject is particularly timely now. I will ask Mr. Morse DellPlain, of Hammond, Indiana, to open the discussion.

MR. DELLPLAIN: We have several speakers competent to discuss this subject, and as soon as the matter is opened for general discussion, I trust we will have at least a half dozen persons ready to tell of the actual experience of their companies.

The discussion of the subject will be divided into two parts:

(*a*) From the steel maker's viewpoint,

(*b*) From the central station's viewpoint.

It has also been suggested that there should be a third section; namely, "From the Furnace Maker's Viewpoint," which point I think is very well taken.

We will now hear from Mr. Gibson of Pittsburgh, on the subject of "What is the prospective demand for electric steel?"

ELECTRIC STEEL FURNACE DEVELOPMENT AND THE CENTRAL STATION

By C. B. Gibson

A.—From the steel maker's viewpoint.

The powerful stimulus of the war has left its imprint on practically all branches of important industries in this country. This is particularly true of the iron and steel and electrometallurgical industries. With the enormous demand for tool and ammunition steels and ferro alloys, and with the shutting off of certain raw materials and finished products, which heretofore were obtained largely from abroad, this country faced an unprecedented situation at the beginning of the war. Fortunately, it was most ably met. Plants were doubled and tripled in size with a correspondingly large increase in the number of electric furnaces, not only in work where they were already in use, but where prior to the war they had not been used, or only to a limited degree.

With the return of business from a war to a peace basis, it is the writer's opinion that there will be a steady and continuous growth along these lines. It is now pretty generally recognized that the electric furnace is preeminently adapted to the manufacture of carbon and alloy steels of the highest quality and in relatively large amounts. Its superiority is due to the greater purity of the metal derived from the electric current and the control of the slag in non-oxidizing atmosphere.

The demand for alloy steel is rapidly increasing, due in a large degree to the requirements of the automobile and the aeroplane and for ordnance purposes. Specifications for steel are becoming more rigid; the public is insistently calling for higher quality, and safety cannot be measured by price. The electric furnace seems to be the solution for meeting these requirements and offers promising possibilities.

The electric furnace has supplanted the crucible method to a marked degree. The steel is of equal quality, can be produced in greater quantity and can successfully compete with the crucible process when handled equally well.

It is evident the lower the cost of production of electric steel, the greater will be the field for the electric furnace, and much will depend on the steel man's ability to bring these costs to a minimum. The cost of producing steel in electric furnaces is dependent on the amount of power used, and this and other conversion items are affected by the tonnage output.

In producing steel of high quality on a large tonnage basis in the electric furnace, there are possibilities in the use of the duplex and triplex systems. When considered in this light, the electric process does not supplant the Bessemer or open hearth process, but simply acts as a refining step in the process.

With cheaper ferro alloys there is a possibility of cheaper alloy steels and tool steel, and also of improved quality from the use of ferro uranium or ferro zirconium.

The field of the electric furnace in the foundry is one of the most promising. The freedom from oxides and low sulphur, the ease with which the desired analysis can be obtained, the simplicity of adding alloys to the furnace charge with little loss, the higher density of the steel and freedom from gases and blow holes, the better physical quality, and freedom from defects in machining, and the ease with which castings lend to heat treatment, due to the greater uniformity, make this process particularly desirable for the smaller steel castings. Further, electric steel can be poured at much higher temperatures, thus allowing the pouring of small castings of intricate shape and small cross section. The electric furnace process is a rapid, clear and accurate one for economically producing steel castings.

In the average steel foundry the electric furnace is charged from cold scrap although there is a possibility of making larger steel castings using the duplex system, the same as in steel mills.

Another promising field for the electric furnace is in the gray iron and malleable iron foundries to refine cupalo iron for making malleable and high grade iron castings.

Up to the first of the year, there were installed in this country approximately 330 furnaces with an annual producing output in ingots and castings of approximately 1,400,000 tons; power consumption of approximately 750,000,000 kw-hrs. per year. This gives the central station man an idea of the importance of this branch of electrometallurgy.

Since electric furnaces require a large amount of power in the locality of the installation, there are many points which must be considered in the establishment and operation of the business, such as, freight on raw materials to plant and of the finished product. These will often offset the difference in cost between steam and hydroelectric power. Power must be sold by the central station at such a price as to allow the user to employ and sell the furnace products at a profit. Conversely the central station must obtain a price for the power which will cover cost of production and a just return on capital investment, including, in addition to the interest returned, even in time of business depression, a just amount for taxes, insurance, operating exigencies—such as storms, lighting, etc., current maintenance, renewals, replacements, etc.

Coming now to the question of ferro alloys, this is an industry in itself, although closely related to the iron and steel industry. The subject is one of absorbing interest and one of the most interesting of all electrothermic processes. Ferro alloys played a most important part in the winning of the war. The enormous demand for tool, alloy and munition steels stimulated their manufacture to a very marked degree.

The expansion in ferro silicon has been approximately 100 per cent, and the United States now leads, with an annual producing capacity of 100,000 tons. This country also leads in ferro tungsten. Considerable progress has been made in ferro manganese and ferro chrome. Previous to the war, one-half of the ferro silicon and ferro manganese was imported, as well as considerable ferro chrome.

The composition of a ferro alloy depends to a considerable extent on the use and conditions under which it is used. One of the problems is to produce a ferro alloy low in carbon and high in the alloying element and low in impurities, which might be deleterious to the steel. Some alloys should also possess a low enough melting point to permit using them in the molten steel bath. This often means increasing the carbon content and lowering the percentage of alloying element. The high percentage alloys in carbon are expensive, as they necessitate greater refining, higher power consumption and often the use of expensive ores for deoxidation. Some of the alloys used quite extensively in steel manufacture are ferro manganese, ferro silicon, ferro chrome, silico manganese, ferro titanium, ferro vanadium, ferro nickel, ferro tungsten, ferro phospherous, etc. Others not used so extensively are ferro cobalt, ferro molybdenum, ferro zirconium, ferro aluminum, silico calcium, ferro boron, ferro uranium, ferro tantalum, etc.

Ferro alloys were originally made in the blast furnace or crucible. These two methods, however, had other limitations. In the blast furnace, the temperature is too low for reducing some of the oxides of the alloying metal. Hence, only metals of a comparatively low temperature can be made. It is difficult to make an alloy low in carbon on account of the large amount of carbon in the charge and it is difficult to make an alloy high in the alloying element. Also in the crucible on account of the smaller scale operations, this is not commercially feasible. Accordingly, the adaptation of the electric furnaces in about 1890 gave promise of good results, and developments have gone on until now the electric furnace is used in the manufacture of practically all the alloys. Ferro silicon is now made with 25, 50, 75, 90 and 95 per cent silicon. Ferro chrome is now made with 60 to 70 per cent chrome with carbon content of 7 to 8 per cent, whereas the percentage when made in blast furnaces was 36 with carbon running about 12 per cent.

Ferro manganese is still made up in large quantities in the blast furnace and a comparatively small amount in the electric furnace.

The amount of power in kv-a. required to accomplish smelting reaction can be calculated theoretically quite closely. It is only necessary to calculate the amount of heat energy to bring up the temperature to the point at which chemical reactions occur, add the heat to initiate the reaction and deduct from this the heat produced from the combustion within the furnace; to this should be added the amount dissipated by escaping gases (calculated from volume) radiation, convection, etc. This converted into kv-a. and taking into consideration the electrical energy loss, gives the total kv-a.

MR. DELLPLAIN: Is Mr. Smith of Buffalo in the room?

AUG. C. SMITH: The electric steel furnace has introduced an entirely new method of making steel, and I think that most of us will find in approaching the steel manufacturer that he is not very susceptible to new methods or changes. The practical steel maker is a man who has learned his trade by close contact with his work. He is not very likely to surrender his own methods, and I am inclined to believe that the introduction of the electric steel furnace is going to be somewhat more difficult than the introduction of the brass furnace or any other application of electric power that the central station has undertaken. But fortunately, the development and use of the electric furnace process are not entirely dependent upon the steel maker. I think they are going to be brought about largely by the increase in the demand for electric steel castings by the ultimate consumers.

Another difficult problem in the application of electric steel furnaces is obtaining available operators who are more or less familiar with the steel end and can adapt themselves readily to the electrical operation. I know of manufacturing concerns which have installed electric furnaces and have experienced difficulty in obtaining competent electric furnace operators.

I am convinced that the electric furnace will be used not only in the production of small high grade castings, but immediately for castings up to perhaps six tons. How much further the electric furnace will go is largely a question of time and development.

It is questionable whether the use of the electric furnace in the production of ingots or billets for rolling mill purposes will be extensively applied in the near future, although I know of one instance of a large forging plant operating electric furnaces on 10-ton ingots used in the manufacture of large shafts for the emergency fleet. When these furnaces were originally installed, the Government engineers refused to pay a higher price for electric steel than for open hearth steel, which latter, they claimed, had always answered the purpose. In one month's operation in this plant on open hearth steel the rejections amounted to a loss of over $20,000 in the labor item alone expended in machining the shafts. The Government engineers then authorized a try out on the electric steel which eliminated practically all rejections. The product proved to be superior in quality to the open hearth steel and was found to be much more easily machined than the open hearth steel.

There is not much likelihood of the present consumers of steel castings, such as automobile manufacturers, taking up their own production of steel castings. While the broader application of the electric furnace may attract their attention, they will still be confronted, however, with the necessity of entering into the steel foundry business which is a business in itself and is not apt to attract a concern in the manufacture or assembling of automobiles or other classes of machinery.

The production of ferro alloys is a branch of electric furnace work that should be considered separately from steel melting. In the production of ferro silicon and some of the other ferro alloys, cheap power is the most important factor, as it amounts to about 80 per cent of the total cost of production, whereas in the production of electric steel the power cost is only about 30 per cent of the total melting cost. This means that in the production of ferro alloys the work must be carried on at points located close to the source of cheap power.

As to the probable producers of electric steel, naturally, the present steel plants are the logical people to take up the proposition, but I am inclined to believe that we shall see small steel casting plants started up pretty much all over the country, close to ready markets and where electric power can be supplied in sufficient quantities. The question of the rate is not as important as the ability of the central station to handle this class of business. It must be admitted that the operation of an electric arc furnace, especially during the period of breaking down, is a pretty severe strain on the electric system and, unless there is a large margin of capacity available, especially sub-station capacity when the power is so disturbed, the furnace operation will probably be a disturbing element for the central station to carry.

MR. DELLPLAIN: Will the revenue developed be permanent and stable, or seasonal? Will Mr. Tillman make some remarks on that, please?

R. H. TILLMAN, Baltimore: The question of electric steel in large quantities is comparatively new and, therefore, it is almost impossible to get facts on past experiences, but when we realize that the production of electric steel has been growing at such a rapid rate, it is reasonable to expect that for a short time at least, we shall have variable revenue from such business, as the demand for electric steel will be erratic until more normal industrial conditions exist. There will, no doubt, be an increasing demand for electric alloy steel, and as soon as the demand reaches the approximate capacity of the electric furnaces installed, the use of electrical energy will become more stable, with a permanent increase in the use of new and additional furnaces.

Answering this question a few days ago, one of the large electric steel manufacturers stated as follows:

"Eliminating such periods as the present one when business is practically at a standstill, I believe that the electric steel industry is a growing one, as the necessity for a material of this character is growing with the more rigid requirements of the automobile and other manufacturing industries.

"Crucible steel, which has been the standard for tools, etc., is being gradually supplanted by electric steel which equals the crucible in quality and far surpasses it in uniformity. It can be produced at a lower cost than crucible steel, all other things being equal.

"The steel business has been called the barometer of industry, as it rises and falls with the average manufacturing interests of the country. This tendency is individual to each concern to a large extent, however, and is dependent upon the degree to which each has developed specialties and the reputation that each has earned in the field.

"Although it is possible to make up and carry a stock of tool steels, and although it is necessary to carry on hand a certain amount of the more standard alloy grades, particularly where small orders and special sizes are catered to, it is not practical to manufacture ahead on alloy steels. This is because the average customer specifies his specific analysis."

Mr. DellPlain: Can this load be secured on off peak and high load factor basis so as to improve the plant load factor?

P. B. Short, Pittsburgh: My discussion is more or less along the line of the disturbing effect of the furnace load on the central station.

B.—From the Central Station Standpoint:

Can this load be carried on commercial circuits or must circuits of special phase, frequency, etc., be installed?

(*a*) Is it desirable to run single phase circuits to cater to this load?

(*b*) Should the central station install or rent frequency changers or special apparatus to furnish users eliminating special circuits, improving regulation, and thus supplying current of any phase or frequency?

(*c*) Effect of furnace load on motor circuits.

Electric furnace manufacturers at first developed their furnaces along lines that would be most satisfactory from a metallurgical standpoint, with very little regard to the electrical characteristics of their furnaces. In recent years, they have realized that the disturbing effect of their furnace load upon the source of supply must be kept a minimum. From the straight metallurgical and furnace end, possibly the single-phase furnace would be the most desirable, but the furnace manufacturers have altered their original single-phase designs so that at present practically all commercial arc furnaces of any appreciable size make some attempt to distribute their load over the three phases of the supply.

Furnaces for the melting and refining of steel and the manufacture of the ferro alloys form the majority of all present furnace installations, and these have been developed to the state where three-phase power is just as satisfactory for their operation as single-phase power. This is especially the case in furnaces of the larger sizes, that is, between 1 and 20 tons capacity.

The matter of providing a single-phase source of supply comes up more in connection with the resistance type of furnace, such as is used for the graphitizing of carbon, rather than with the arc furnace used for steel and ferro alloys. The resistance furnace is inherently a single-phase load, so the only method of approaching a balanced load is secured by installing a sufficient number of unit furnaces so that they may be equally distributed among the three phases of the supply. Even if this equal distribution can be secured, there is no assurance that balanced power will be secured, for it is very unlikely that with a group of three furnaces, all three will be started together and their power requirements kept equal. Instead, the usual practice would be to start the three furnaces at different times so that they could be handled by a minimum number of operators and laborers.

A load which closely approaches a balanced load can be secured with heat treating furnaces of the resistance type, by distributing the resistors equally among the phases. Where two furnaces are operating on castings, for instance, with one operating at a higher temperature than the other, common practice is to have the lower temperature furnace consist of one element, placing this across one phase, and to have two heating elements in the higher temperature furnace, placing each one of these across the remaining two phases of a three-phase supply. In this manner, by proper control, a very desirable steady balanced load can be secured.

Furnaces for the melting of brass are at the present time attracting considerable attention, and the number of installations of this type is steadily increasing. There are a considerable number of brass furnaces on the market, and the majority of this type also attempt to take a balanced three-phase load from the supply. However, there are some brass furnaces that are essentially single phase in both the arc and resistance type, and these draw entirely a single-phase load. A great many brass furnaces will be installed in small plants and in general they will be of small kv-a. capacity. For this reason the amount of unbalanced power which they require is not as important as it is with the other types of furnaces previously mentioned. This is the case because the necessity for a single-phase supply depends greatly upon the comparative size of the unbalanced load, and the size of the supply system.

By summing up the characteristics of all the various types of furnaces, it can be seen that while many of them do not draw an absolutely balanced load, in general their requirements are not such as to make a single-phase source of supply necessary.

With certain steel furnace installations, it is impossible to draw a balanced load due to the design of the furnace, arrangement of the electrodes, and the transformer connections employed. In many other installations where the furnace is designed to take a balanced load, an unbalanced load is actually secured by a poor lay-out of the heavy current leads. This unbalance could, in a great many cases, be eliminated by taking more care in the arrangement of the low tension leads, so that approximately equal reactance drop is secured in each lead to the furnace.

The matter of the frequency of the supply has not greatly affected the installations of furnaces, for steel furnaces up to a capacity of 15 tons with a 3000 kv-a. transformer are now in use, and operating from a 60 cycle supply. It is true, however, that a certain limit is reached where the problem of getting the actual energy into the furnace becomes important. This limit is reached first with 60 cycle furnaces, and the upper range of capacity can be raised by increasing the number of electrodes and bringing the power into the furnace from more than one bank of transformers. With 25 cycles, the problem of getting power into the larger sized furnaces is not so marked, and with this frequency a higher operating power factor can be secured. Therefore, in view of present practice, it may be said that either one of the commercial frequencies, that is, 25 or 60 cycles, is very satisfactory for steel furnaces of the arc type.

The only steel furnace that really requires a special frequency for its satisfactory operation is the induction furnace. This type of furnace, while having the advantage of requiring no electrodes and a comparatively inexpensive roof, has not been used to a great extent in this country. In the few present installations, special low frequency generating or converting machines are used at the furnace plant.

In view of the large number of commercial furnaces that are operating satisfactorily from present three-phase circuits of standard frequency, it appears that the necessity of supplying special phase and frequency circuits by the central stations is not great. When the process of a furnace plant is so special that it must depart from commercial furnaces and have special requirements, it seems that the furnace plant itself should provide the special machinery, such as phase balancers, or frequency changers, and this should not devolve upon the central station.

There is no question, however, but that the installation of special apparatus at every furnace installation would materially improve the regulation and power factor of the load, but the added expense and resulting decrease in efficiency are entirely unwarranted for the average furnace. If such procedure were necessary, it would be better to balance the various furnace loads as nearly as possible, and then take up the entire unbalance by means of a phase balancer installed at the central station.

The action of motors on a furnace circuit is to try to compensate for any unbalance in load taken by the furnaces, so that the more polyphase motors that are on a furnace feeder, the smaller will be the unbalanced load which will have to be supplied by the generating equipment. However, where this may be desirable in helping to balance up the load taken by a certain feeder, it should be remembered that this balancing tendency of the motors causes more heating in the motors and reduces their torque and efficiency. This is more marked with synchronous motors than with induction motors, because synchronous motors have a higher admittance for the unbalanced current. In this way, if loads are over-motored, the reserve capacity of the motors will be reduced, or if the motors are working up to their full load on a balance system, they will be overloaded on a badly unbalanced system.

The fact that the reserve capacity of the motors is reduced when operating from an unbalanced feeder, may result in customers installing larger motors, so that they will have their full reserve capacity for occasional operation. If this is the case, the larger motors will operate on a lower power factor on the normal load, and the result will be that while the motors are correcting for the unbalance, they are also pulling down the power factor of the system.

By the proper application of automatic regulators on most commercial electric furnaces, the furnaces can be made to draw very close to a balanced load, and at the same time a load that is comparatively steady and desirable for the power companies. After the arc is first struck on a cold charge, the automatic regulators can be so set that they will hold the load very closely to a constant value. The use of automatic regulators also allows the placing of a minimum amount of reactance in the circuit for the reduction of surges, so in this way the power factor of the load taken by the furnace is greatly improved. This elimination of surges and small unbalanced load given when automatic regulators are used should allow a motor load to be taken satisfactorily from a feeder that is also supplying electric furnaces.

MR. DELLPLAIN: This subject is now open for general discussion, although we have about used up our time. If any one has a concrete answer to give in a very few words, we would like to hear from him at this time.

W. E. MOORE, Pittsburgh: As a rule ferro alloys aside from ferro manganese are necessarily made in electric furnaces in order to meet the commercial conditions. There seems to be a large and growing field for special alloy steels in castings. That branch of the steel foundry business has not been well looked after as yet, but the electric furnace readily permits foundrymen to make such special high strength or tool steel castings.

The large steel corporations will probably use electric steel furnaces to make special alloy, tool or forging steels, but electric furnaces are not likely to replace immediately large open hearth furnaces for making rails or shapes where hot metal is available. The electric furnace is certainly going to do the work of the steel foundries, tool steel works, medium and small rolling mills for the production of special steels, such as forging steels, wire steel, gun and armor steels.

It is today not only the most modern, the cleanest and most certain and flexible means of making steel, but it is also the cheapest for such uses where suitable electric power is available. The small converter has been the means of making small steel castings, but today the electric furnace, with favorable power prices, will beat the converter two to one on quality and cost of casting steel in the ladle.

The question of whether the electric furnaces will be located in large industrial centers where cheap scrap is available, will be determined by the market for the electric furnace product more than by the scrap supply. The electrical steel foundries will usually be located around the industrial concerns which use their products, such as automobile factories, and so forth.

The electric furnace is an expensive means for producing pig iron unless very unusually low priced power is available. It is also an expensive means for producing from hot blast furnace metal the ordinary low grade steel or "tonnage steel," such as structural steel or rail steel; for such steels it is expensive in comparison with large open hearth furnaces receiving hot metal or receiving duplex metal from Bessemer converters.

The central station is in the best possible position to compete with the isolated or industrial power plant for the electric furnace load on account of the better diversity factor on central stations. The electric furnace load for steel melting is necessarily a somewhat fluctuating load, and a large power system can carry a load of that kind without noticeable interference or bother, whereas a small isolated plant cannot do so well with it. The iron furnace companies producing power by gas engines from blast furnace gas do not seem to have done very much in the way of reducing the cost of electricity as was expected a few years ago, and costs are comparatively high as compared with the modern large central stations using large turbo-generators.

The electric furnace is going to be very largely used in making all classes of tool steels and for the many varieties of alloy steels. The excessive losses of expensive alloys required for doctoring the metal in open hearth furnaces will be much reduced when the electric furnace is used; as, for instance, where uranium steel or vanadium steel is made, the loss is very high, but it is not noticeable with the electric furnace properly operated on such steel. The electric furnace, in the production of fine steels, is always under complete control as to the various metal and non-metal elements, and as to higher temperature so necessary in producing the light higher grades of steel castings. I know of one foundry running on the converter process and its yields were running from 40 to 45 per cent in weight of castings shipped to metal charged. When the electric furnace was substituted the yield was immediately increased 60 to 70 per cent. Electric steel is always better steel when made to the same chemical specifications than either open hearth or converter steel. In one case where they had a Moore Electric Furnace and Converter in the same foundry in making certain Government steel that called for both chemical and physical requirements, when the steel in the converter was made on the proper chemistry, 80 per cent of the castings were rejected on the bending tests; when the steel was made in the electric furnace, 95 per cent of the castings passed all five physical tests beginning with the bending test.

Appreciating the superior quality, many users of steel are beginning to specify electric steel. Such specifications force the foundries to consider the electric furnace, irrespective of costs. I know of some firms which are specifying in their requests for quotations, "electric steel preferred."

The electric furnace in the average size industrial establishment, such as a foundry, generally can be operated only from central station power, on account of the large power required.

MR. DELLPLAIN: It is unfortunate that we have not more time, but we have already encroached on the next subject. I want to take this opportunity of thanking everyone who helped make this discussion a success.

CHAIRMAN JONES: Our last paper of the afternoon is on a topic we have been talking about more or less for five or six years, but it has been brought to mind more in the last year or so, due to the increase in costs. The discussion will be led by Mr. R. H. Knowlton, of Philadelphia.

MR. KNOWLTON: Mr. Chairman and Gentlemen, I once had the temerity to labor under the delusion that power factor was a relatively simple question, but having given the matter a small amount of study I am convinced that the problems in connection therewith are myriad, and therefore, personally, I am very sorry that all the power men of the country are not here so that our discussion might be very general, and also that time will not permit of the allocation of another session to this subject. One of the first problems that confronts us in this question is explaining its meaning to our consumers, and I will ask Mr. Tillman to tell us how that may best be done.

POWER FACTOR IN CONSUMERS' INSTALLATIONS

By R. H. Tillman

One of the most important questions in considering the investment necessary to supply a customer, and consequently an important feature in rate making, is the power factor at which the demand is taken. We realize that the power factor affects the generating capacity, line capacity, cable capacity and transformer capacity of an electric system, and, therefore, the fixed cost per unit of demand taken from the system should be sufficient to take care of the kv-a. in the system rather than the kw.

It is inherent with certain types of equipment to have low power factor while other types have high power factor. It is preferable to consider separately the large and small customers because in practically all of the large industries there is to be found sufficient technical talent for a complete understanding regarding the matter of power factor. The small or average industry does not have this talent. The question of electricity is so mysterious that it is difficult to get the average industry to adopt this form of power. We should endeavor to simplify the terms and rates as far as possible rather than to surround electric power with more mysteries.

Then the question is, how can the question of power factor be handled properly with these customers? Of course, to make an effective rate based on power factor, a rate which will not be discriminatory, we must apply the power factor principle to all customers alike, both large and small, a principle that would charge customers under a certain power factor and give a credit to all customers over a certain power factor. This method would enormously complicate the metering of customers and in many cases the added cost would materially exceed the added revenue. I agree that there should be a power factor clause in all rate schedules for large power installations and that everything possible be done to improve the power factor both inside and outside of the customers' plants.

The outside power factor correction, of course, is entirely the central station's part, and the inside is principally the customer's part, but it should have the assistance and cooperation of the central station. With this proper cooperation between the customer and company, there should be little difficulty in maintaining a good power factor.

In some cases we would have to explain why it is necessary to charge or to correct for power factor, and in those cases it would depend on the customer as to just what method of explanation to make. For example, if he is a former owner of the plant, we should show him in dollars and cents the actual increased cost due to low power factor and how it affects fixed costs. If he is a mechanical man, use the mechanical method illustrating the similarity of wattless current and the added weight on a crank attached to the end of a revolving shaft. If he is a man familiar with the pumping of water, use the hydraulic principle. By the same token if he is a brewer whom the central station desires to convince that alternating current motors used in the manufacture of ice will be better business after the first of July, just show him the similarity of a glass of beer to the fixed costs of central station service, wherein the foam on top of the glass represents the wattless current.

It is evident, therefore, if we must explain power factor in an untechnical manner, it is necessary to deal with the question in terms with which the customer is familiar.

In addition to this there is one question which arose during the discussion on isolated plant costs which must be kept in mind. It is not a question entirely of cost of central station energy as compared with isolated plant cost, but it is a question of service. If we can explain to customers that better service can be obtained, that is, with less shut-downs and less difficulties experienced with central station service, it will go a long way in assisting to obtain and hold business.

The most difficult problem which we will face this year will be the changing of the attitude of those customers who had contracts with central stations, but who did not receive good service and full supply of electrical energy due to the central station being unable to get coal, or other station difficulties. The attitude of some of these customers at the present time is that as soon as their contract expires they intend to install their own generating plant and take chances as to the probable cost of operation. With the proper engineering sales ability these problems can be solved and the attitude of these customers changed, and by the same method questions of power factor can be satisfactorily handled with large customers.

MR. KNOWLTON: I know someone will surely bring up the point so I will ask Mr. Tillman to be thinking it over. In choosing an analogy it is well to select one that will be generally understood. The one suggested by Mr. Tillman will soon be an enigma to all except the oldest inhabitants due to coming of National Prohibition January 1, 1920.

I think Professor Scott of Yale University is present, and I would be glad to have him discuss this subject.

PROFESSOR C. F. SCOTT: I am taken a little unawares, as I had not expected to speak on this question. Power factor taxes the ingenuity of the engineer as well as the electric circuits through which the current passes, and it also taxes the credulity of the customer when you try to explain it to him. It is one of the mysteries of electricity, and in the early alternating current days when there was something that we did not understand, it was usually attributed to the power factor; and in fact the power factor is the source of a good many difficulties.

The last paper made a good point in suggesting that analogies must be selected which involve things with which the particular customer is familiar. I remember, in College instruction a few years ago, one of my assistants used hydraulic analogies which seemed very simple and clear. He found that the students did not grasp them. The class had not yet had hydraulics, so that he had to teach the hydraulics and then bring in the electric analogy; a little later the students found hydraulics easy, because they had learned the laws governing the flow of electricity.

I once used this method of explaining power factor: An induction motor requires two kinds of current, one for keeping the motor in running condition and the other for supplying the power required by the load. I said that the purpose of the electric system is to transmit energy, for example, from a water wheel to a mill. The power required by the mill is received by the electric generator, and the electric system transmits it through to the shaft of the motor, and whatever power is required by the mill is developed by the water wheel, and the electric system transmits current varying in proportion to the amount of power. But supplementing this current which carries power from water wheel to mill, there is another current within the electric system itself which is not concerned with the load at one end or with the generator at the other. Technically, we call it a magnetizing current; the generator must furnish it and the line must carry it; but only to an incidental degree does it concern things outside of the electric system. The motor requires this wattless or magnetizing current at all times, whether it is empty or loaded. The generator and line must supply both currents, and the ratio between the current which supplies the power and the total current is the power factor. It is the total which determines the electric capacity of the generator and of the transmitting apparatus. The central station should receive pay for the apparatus which keeps the motor in readiness to supply a load, as well as for the power current which actually operates the mill.

Once I was riding on the train near Niagara Falls, and entered into conversation with a man who was a purchaser of electric power. He immediately began to tell about the unfairness of the power company in charging for something that he did not get. Power factor didn't do him any good, and yet they wanted to charge him for it anyhow. He was very indignant at the injustice. I explained to him that carrying electric current is something like carrying freight. He could not get a fixed rate per ton regardless of the volume. He would have to pay a high rate per ton for a car load of bed springs because the "power factor" is so low.

Mr. Knowlton: I will call on Mr. Treat of Schenectady in regard to the next topic.

POWER FACTOR CORRECTIVE APPARATUS

By Robert Treat

Without wishing to anticipate in any degree conclusions which may be drawn from later discussion of this subject, it may perhaps be said that the power salesman may expect to be confronted to an increasing extent with the problem of how to sell power on a contract containing an enforced power factor clause, to a prospect whose power factor is low. The question is how can he help the customer improve his power factor. The best means, because the most economical, for improving power factor are:

First: Reduction of over-motoring, where such exists.

Second: Greater use of synchronous motors.

Third: More general use of static condensers.

Various means are at hand for the neutralization of wattless kv-a. The most common method is the insertion in the circuit of a synchronously rotating apparatus whose direct current field is over-excited. This apparatus may be a synchronous motor; it may be a turbo-generator floating on the line without energy load; it may be a synchronous condenser without mechanical load; or it may be a motor condenser, a term rather loosely applied to a synchronous motor of any power factor less than 0.8. More recently two new forms of corrective equipment have made their appearance in the static condenser and the phase advancer. Each of these types has its particular field, and though the dividing line between specific territories of each may be rather vague, little difficulty should be encountered in fixing upon the proper machine for any application, once the characteristics of each are understood and the conditions under which it is to be installed are thoroughly considered. With the omission of the turbine, which is a rather exceptional use, the apparatus mentioned above may be divided into two general classes. In the first category come the synchronous motor and motor condenser, which perform a dual function—power factor correction and the tranformation of electrical into mechanical energy, in the second come the static and synchronous condenser and the phase advancer, which have a single function only—power factor correction. I propose first to consider the double duty class.

The most outstanding feature of power factor correction by means of the synchronous motor is the well known fact that the corrective duty and the power duty combine *at right angles,* to determine the kv-a. capacity of the machine; so that as we reduce the power factor from unity there is realized a gain in corrective capacity out of proportion to the increase in size of the machine. This is particularly evident at values quite near to 1.0 P. F. For example, if we require 100 kilowatts in mechanical power, we can by installing a motor of 0.8 P. F. also obtain 75 kv-a. corrective, while the size of the machine, neglecting losses, is increased only to 125 kv-a. By paying for an additional 25 per cent in total capacity we have obtained in corrective capacity 75 per cent of the kilowatt rating of the machine. Should we select a 0.9 power factor machine, our reactive current, though there would be less of it, would be cheaper yet (about one-fifth instead of one-third the price per kv-a.).

When we come to motor condensers of low power factor, the cost of corrective capacity increases. These observations presuppose a fixed relationship between machine cost and kv-a. capacity of the armature, regardless of the size, speed, power factor and mechanical arrangement of the equipment. This is, of course, not exact in specific cases, but it gives an indication of what can be accomplished. It may, therefore, be concluded that, when a synchronous motor is to be installed, the most economical method of simultaneously correcting power factor is to increase the size of the motor sufficiently to accomplish both objects at once. There may be a very few cases where the motor is of very low speed, and the amount of correction required is relatively large, where it might be more economical to install a separate high speed condenser rather than to increase greatly the size of the motor, which is relatively expensive per kv-a. on account of its low speed. Such a combination of circumstances is relatively infrequent and we need not here take the time for an analysis.

The question most frequently encountered, however, is not the advisability of increasing the size of a synchronous motor to permit of power factor correction, but the feasibility and economy of substituting a synchronous motor or motor condenser for an induction motor. This problem must be examined from two

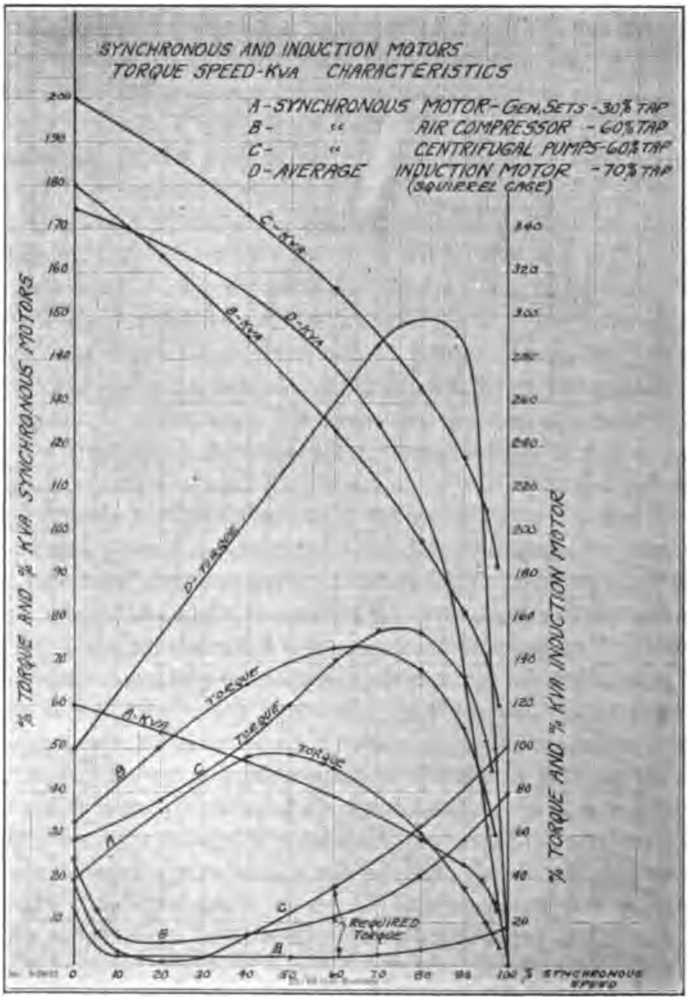


FIG. 1

angles; first, whether a synchronous motor can be built whose characteristics meet the requirements of the application, and, second, whether the desired correction is worth the additional cost of the synchronous apparatus. In regard to the first condition it may be said that considerable improvement has been made in the design of synchronous motors so that they are now suitable for many applications which previously demanded an induction or a direct current motor. Conversely, many processes have been so modified as to permit the use of synchronous motors. The field of their application has appreciably broadened in the last few years. It is hardly too much to say that practically any application not requiring variable speed is a proper subject for a study of the possibilities of synchronous motor drive. Fig. 1 shows the variation in torque at different speeds of synchronous motors for different services, and for an average induction

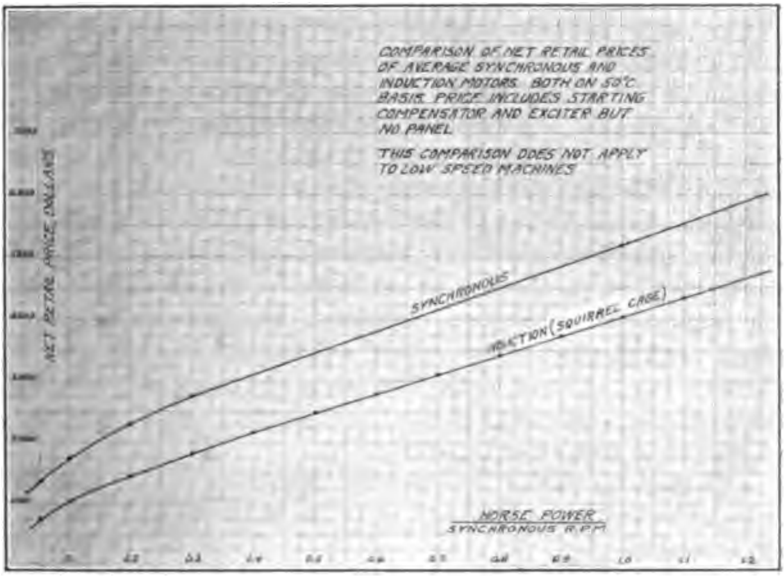


FIG. 2

motor. It will be noted that, within limits, practically any starting torque can be obtained, provided the requirements at pull-in are not too severe. The converse also holds true, as witness the use of synchronous motors for driving air compressors, centrifugal pumps, blowers, grinders and other apparatus of similar requirements. Further improvements quite recently made will doubtless render the synchronous motor available for a still wider range of applications. These remarks apply as well to small as to large motors. Hence, many applications which now use only induction motors of small and moderate size, chiefly for reasons of greater simplicity and lower cost, may soon make increasing use of synchronous machines. If the demand for, and production of, small synchronous motors reach a magnitude comparable with the present production of induction motors, it is quite possible that prices might thereby be reduced until the two types are more nearly on an equal footing.

Having assured ourselves that a synchronous motor is suitable for the application, it is in order to inquire into the additional cost of substituting it for an induction motor. Fig. 2 shows relative costs of average 0.8 power factor synchronous and squirrel-cage induction motors. While it is readily apparent that ordinarily the synchronous motor costs more money, it should be clearly understood that the difference is considerably less than the cost of a separate condenser to give the same reactive kv-a. This is illustrated by Curves E and D at the bottom of Fig. 3. In very general terms, it may be stated that to obtain a certain reactive kv-a. by the substitution of synchronous motors for induction motors costs only from one-fourth as much for moderate sizes, to one-half as much in the larger capacities, as the employment of separate condensers. Furthermore the losses when using a synchronous motor will usually be from one to three or four per cent lower than when employing an induction motor of the same energy output in conjunction with a condenser of the same corrective capacity.

It may reasonably be concluded with very few exceptions that whenever motor capacity is to be increased and wattless kv-a. neutralized at the same point, both objects can be accomplished more economically in one than in two machines. This means a greater use of synchronous motors and motor condensers.

Frequently it is found desirable to improve power factor when there is no possibility of increasing or rearranging the motor capacity to secure a greater use of synchronous motors. For this service we must turn to Class II, embracing unifunctional machines, static and synchronous condensers and phase advancers. It is a little surprising that this latter device has been used to such a small extent up to the present time. It is not by any means a cure-all for power factor ills, in fact its scope is extremely limited, but suitably applied, the phase advancer offers a means of power factor correction which compares favorably with the synchronous motor. So far as my knowledge extends, only one installation is in operation in this country, though I believe there are several abroad. There is a difference of opinion as to the suitability of the phase advancer as a means of power factor correction, some being of the opinion that everything that it will do can be accomplished to better advantage by some other means. Consequently, no serious attempt has been made to standardize the manufacture and reduce costs, so that the phase advancer is doubtless more expensive than if it were being produced on a quantity basis. The cost per kv-a. of correction will vary widely with the size and characteristics of the motor and the amount of correction desired. Put on a manufacturing basis, the phase advancer might be expected to cost $2.50 per kv-a. of correction, with the probability that the average would be less rather than more than that figure. The decrease in over-all efficiency of the equipment would, in a majority of cases, be less than 1 per cent. The chief disadvantages of the phase advancer are as follows:

1st—Can be used only with an induction motor having a phase wound rotor.

2nd—The amount of correction is quite dependent upon the design of the apparatus and the load on the motor, and is insusceptible of variation. The correction is negligible with no load on the motor.

3rd—It is unsuitable for motors which are frequently started and stopped, or which are reversible.

4th—If the motor is shut down for any reason the phase advancer is useless.

5th—It becomes rather expensive to correct the motor power factor beyond unity.

Turning back to the condensers, each has it particular advantages and disadvantages. The synchronous condenser is the more flexible, inasmuch as its load can be varied to suit the needs of the circuit; with the addition of a voltage regulator, it will automatically adjust itself to any requirement within the limit of its capacity, and maintain essentially constant voltage at the machine terminals. Above a certain capacity the synchronous condenser costs less than the static per kv-a. but its losses are higher in all sizes. The static condenser is particularly advan-

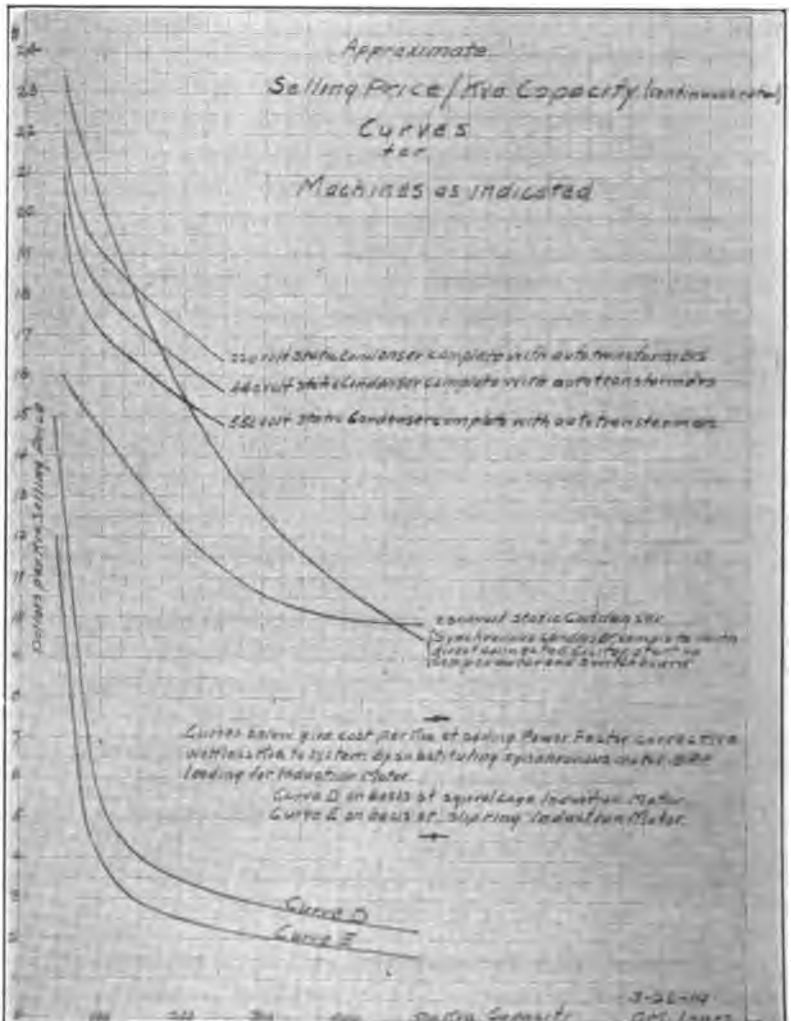


Fig. 3

tageous for small installations; it requires very little attention, no special building, foundations, or location, has no moving parts to wear out, and very low losses. Its value increases directly with the frequency, and so far it has not been standardized below 40 cycles. The comparisons here made are all on the basis of 60 cycles.

A set of curves, Fig. 3, has been made up to show comparative costs per kv-a. between static and synchronous condensers. These curves indicate that the static condenser costs less than the synchronous below the following capacities at:

Volts	*Kv-a.*
220	130
440	175
550	210
2300	475

More important than first costs, however, are annual costs, and the curves, Fig. 4 to 9, have been prepared to bring out the comparison between synchronous and static condensers at 220, 440, 550 and 2300 volts, up to 1000 kv-a. They are based on a number of assumptions as follows:

1. Use at 100 per cent capacity for 3500 and 7000 hours per year.
2. Power at ½, ¾, and 1½ cents per kilowatt-hour.
3. Capital charges of 15 and 20 per cent.
4. No attempt has been made to evaluate the difference in attendance and housing charges.

These curves are rather startling in what they imply, if examined only superficially. Each group has been plotted to the same assumed conditions throughout. One group, for example, is based on 7000 hours' use per year, 15 per cent capital charge and 1½ cents per kilowatt-hour, for all capacities. These particular curves indicate that the rotating apparatus has a higher yearly cost even at 1000 kv-a. than any of the static machines, and it appears that the 2300 volt static condenser could be advantageously employed in much larger capacities under these conditions. At ¾ cent per kilowatt-hour, however, the synchronous condenser is on an even basis with the 550 volt static, is superior to the 220 and 440 volt, and is still inferior to the 2300 volt static condenser. With a capital charge of 20 per cent instead of 15 per cent, the synchronous condenser shows up a little more favorably. With 3500 hours' use, however, which is perhaps more usual for a majority of installations, at 15 per cent capital

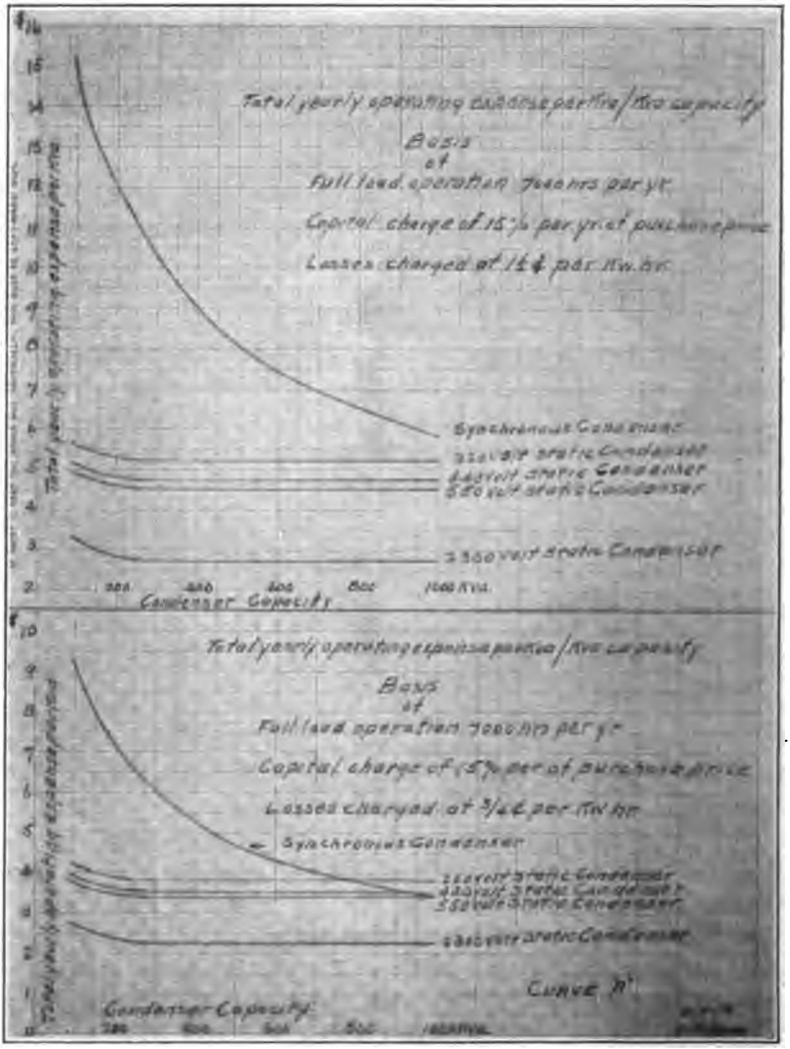


FIG. 4

charge and 1½ cents for power, the synchronous machine is found to be on an equal footing with the 550 volt static, superior to the 220 and 440 volt, and inferior to the 2300 volt, at 1000 kv-a. Under the same conditions with power at ¾ cent, the synchronous is superior to the low voltage static condensers, and

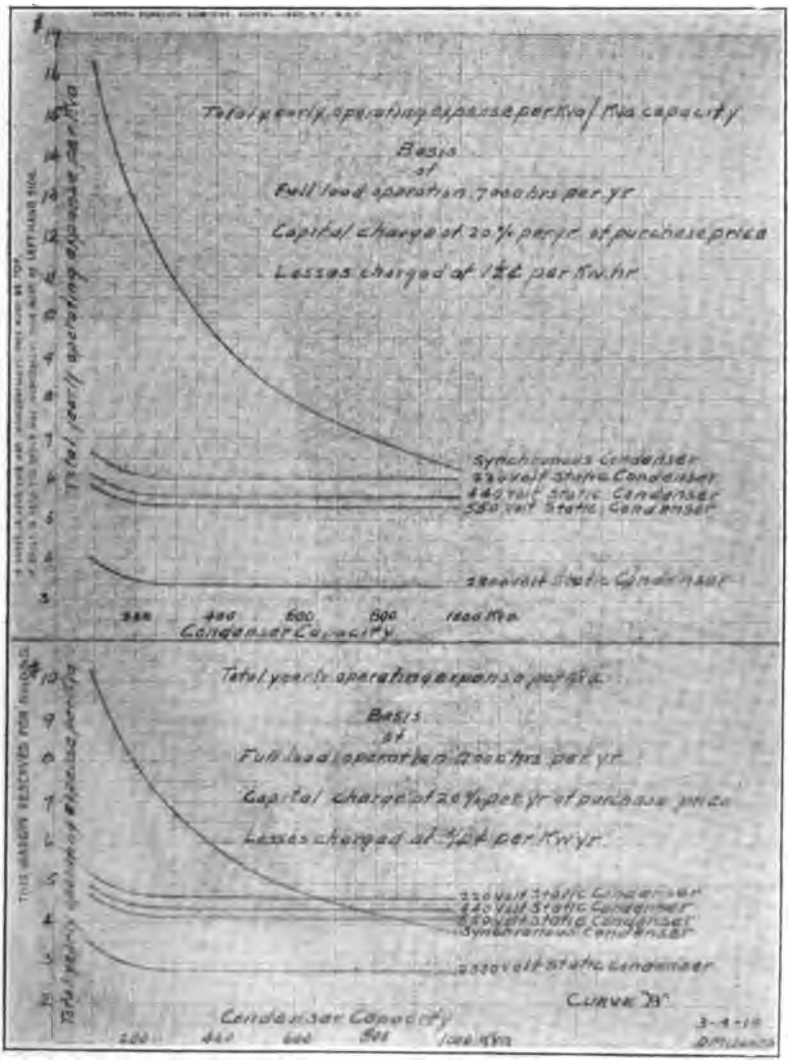


Fig. 5

Com.

only slightly inferior to the 2300 volt machine at 1000 kv-a. Changing again to a 20 per cent capital charge, the synchronous condenser is, at 1½ cents for power, superior to the low voltage but inferior to the 2300 volt static, while at ¾ cent power, the synchronous is superior to all at 1000 kv-a. If we reduce the

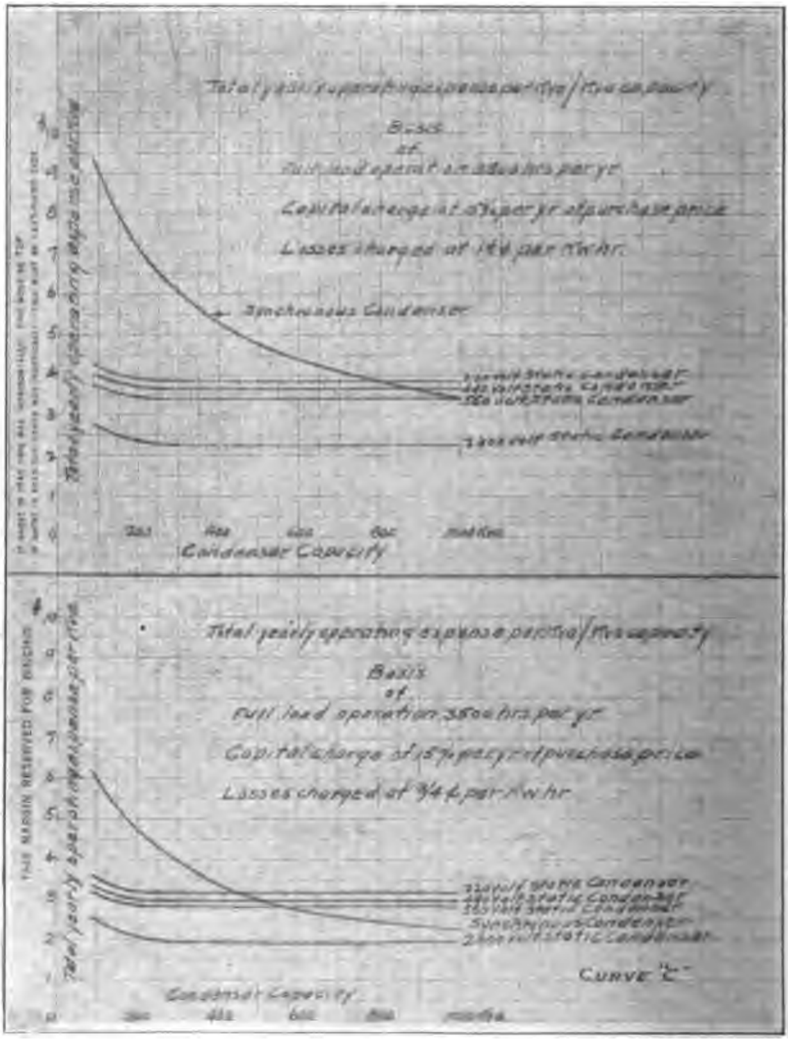


FIG. 6

power charge to ½ cent, the synchronous condenser shows up still more favorably.

From these curves it is at once apparent that, on the basis of annual cost only, the static compares favorably with the synchronous condenser in capacities as high as 400 to 800 kv-a., in

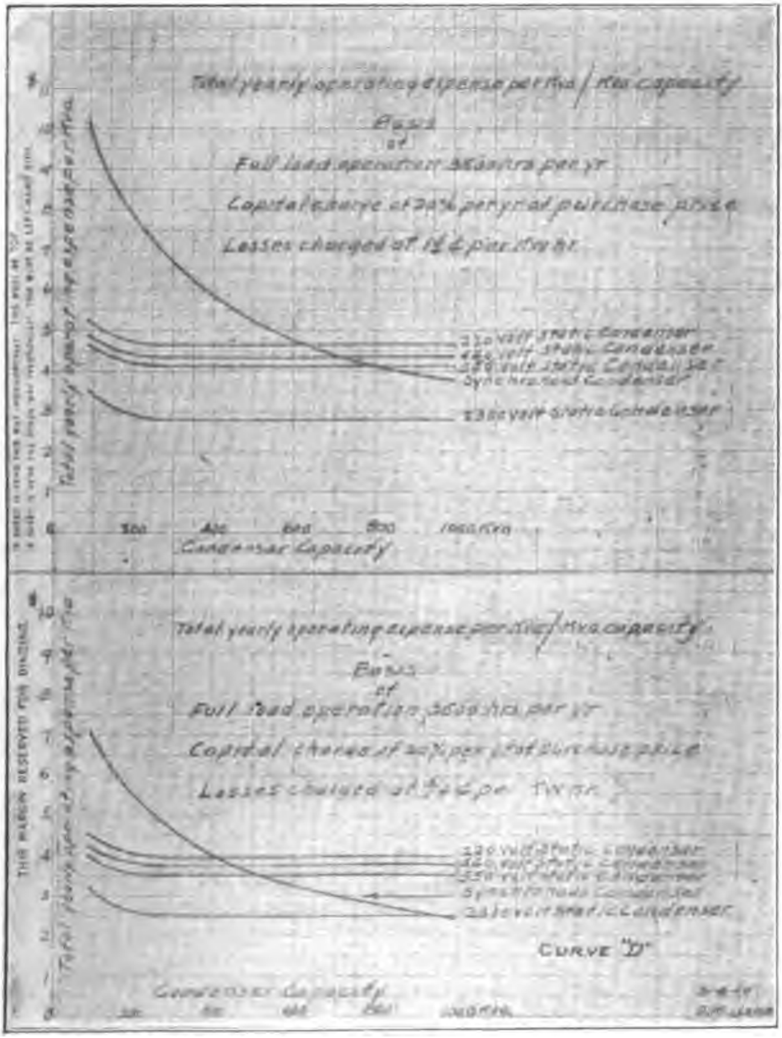


Fig. 7

the 220, 440 and 550 volt sizes, while the 2300 volt static can be used to advantage in somewhat larger capacities. On the basis of power at ½ cent, capital charged at 15 per cent and 3500 hours use per year, the economic limit of the stationary apparatus appears to be about 400 kv-a. for the low voltage and 800 kv-a. for the 2300 volt condensers.

And now a word as to attendance. What constitutes skilled labor is a matter of opinion, and hence of debate. Even removing the jacket from the humble potato requires a certain degree of skill and it is difficult to maintain that more intelligence and longer experience are required for the performance of one task

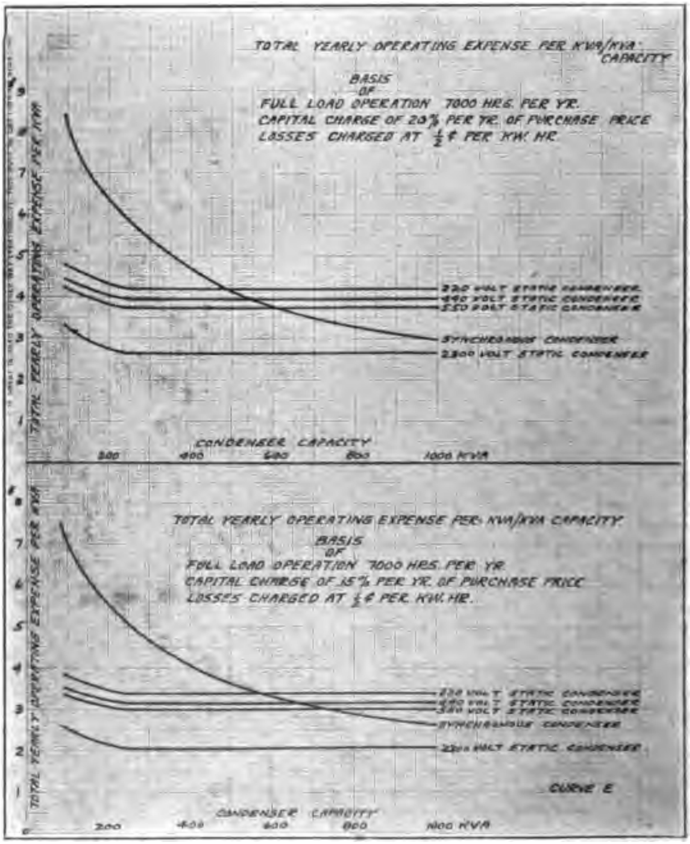


FIG. 8

than for another. More operations must be performed in a certain specified order, to put a synchronous motor or condenser into operation, than are required for a static condenser; and therefrom it may be argued that the rotating apparatus requires a greater skill than the stationary. However, it may be stated that

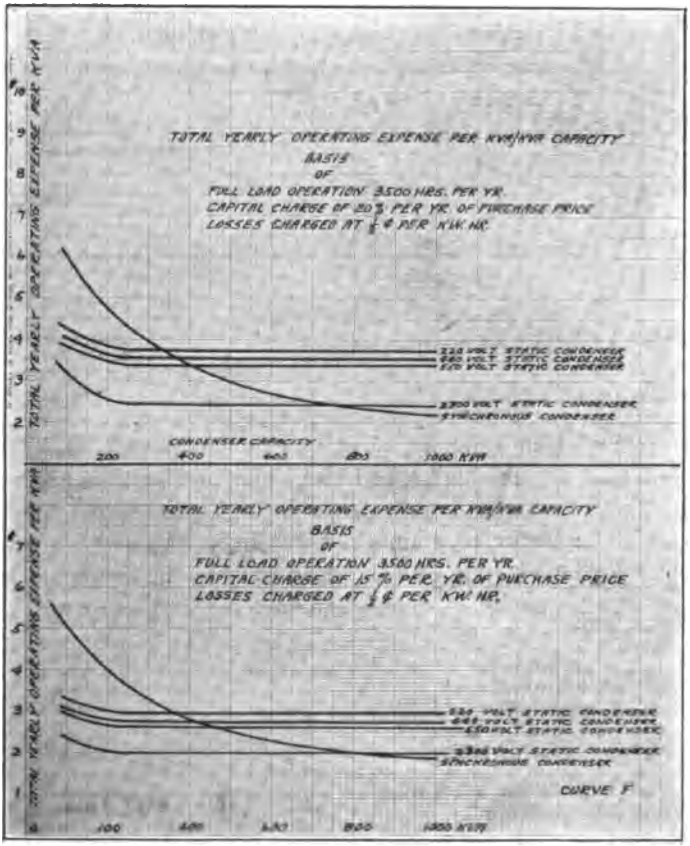


Fig. 9

a synchronous condenser is operating quite automatically, with only occasional inspection, and there appears to be no technical reason why static condensers should not be controlled in a similar manner. Indeed, automatic control by time-clock is already under advisement.

In fine, the arguments for and against the more important means for power factor correction may be summarized as follows:

Synchronous Motor (including Motor Condenser):

Advantages:

The cheapest means for obtaining power factor correction.

It usually combines high efficiency with corrective capacity.

The correction can be varied to suit the needs of the circuit.

Disadvantages:

Sufficient field must be maintained to hold the motor in synchronism.

It may be costly if low speed.

It requires some attention.

Synchronous Condenser:

Advantages:

It may be high speed and therefore fairly cheaper kv-a.

Advantage may be taken of an automatic voltage regulator to maintain constant voltage.

The amount of correction, within the limits of its capacity is dependent only on the needs of the circuit.

Disadvantages:

It is more costly than synchronous motor and motor condenser.

Special foundations are required.

It requires some attention unless automatic.

The losses are higher than for static condenser.

Static condenser:

Advantages:

The cost is comparatively low in small sizes.

No special location nor foundations are required.

The losses are low.

Very little attendance is necessary.
There are no moving parts to wear out.

Disadvantages:

The capacity is less easily varied than that of the synchronous condenser.
No lagging correction is obtainable.
The cost is high in large sizes as compared with synchronous condenser.

Mr. Knowlton: In connection with the next topic, in the absence of Mr. B. H. Gardner of New Britain, who has prepared the discussion, I will ask Mr. Nichols of New York, to read it.

Mr. Nichols: In preparing this material Mr. Gardner first takes up the situation with regard to the consumer, with voltage regulation, operating efficiency and cost of apparatus, and then from the standpoint of the central station as regards investment cost and operating cost.

Result of Low Power Factor

B. H. Gardner: I have been asked to discuss briefly the result of low power factor; first as it affects the consumer as regards voltage regulation, apparatus efficiency, and cost of apparatus, and second as it affects the central station as regards investment cost, operating cost and service.

Voltage regulation has generally been considered a matter for the utility company to worry about, but it is a matter that affects the users of electric service most vitally. Where so large a proportion of the power of the country is supplied over transmission lines of greater or less length, the question of regulation is of prime importance. There are thousands of communities that are served by lines of limited capacity, where the available business will not justify additional investment, and where the voltage regulation is exceedingly bad on account of poor power factor brought about principally by underloaded induction motors. In such places the entire community has to contend with inferior service and it is often caused by some single concern. Over long lines it is often impossible to give reasonbly good regulation for furnace loads and for lighting. Then again the individual power consumer may suffer from poor regulation caused by low power factor. A case recently came to my attention where there was some 800 to 1000 horsepower in one part of a factory. These motors were some distance from the center of distribution and the voltage was only 440 volts. The feeders were designed and installed for 80 per cent power factor, but as under actual operating conditions the power factor was only from 50 to 60 per cent, the losses in feeders were much greater than had been anticipated. As a result the voltage dropped so low that it was impossible to operate all the motors at one time, and for some months that department had to be operated in shifts, part of the plant running during the day and part during the night. A place was found for a synchronous motor and the power factor was brought up to around 90 per cent or better and there was no further trouble.

Taking up the question of apparatus efficiency, we all know that the efficiency of motors is less at fractional loads although fortunately for the consumer the efficiency holds up much better than the power factor. On most motors the efficiency curve is approximately a straight line until the load falls below 50 per cent of normal rating. From full load to one-half load the efficiency of motors of 25 h.p. to 50 h.p. falls off only about 2 to 3 per cent whereas the power factor falls about 15 per cent. Where motors below 10 h.p. are used to any extent the drop in efficiency is a more serious matter.

One factor that is practically never given any consideration by the power consumer is the loss in wiring but this may be quite an item, and such loss is of course largely increased as the power factor decreases. For instance the losses at 60 per cent power factor are twice as great as at 85 per cent power factor, and if we assume a load of 100 kw. where the wiring was designed for 5 per cent losses at 85 per cent power factor, we would have 10 per cent losses at 60 per cent power factor, and this difference in loss at a net rate of 2 cents per kw-hr. would amount to slightly over $200 per year or $2000 in 10 years. If this figure is increased from a 100 kw. load to the total amount of electric power supplied, it will be seen that these losses cost the power consumers of the country a large total sum each year, and justify a considerable expenditure in order to keep the motor well loaded and the power factor high.

The cost of equipment to the consumer is naturally high where the motor equipment is larger than is actually required. Not only is the cost of the motor equipment itself high, but the cost of all feeders, switches, and all wiring is higher than necessary. A case recently came to my attention where in an installation consisting of only four motors totaling 140 h.p., the cost of motors and wiring was approximately $800 or 40 per cent more than was necessary if the motors had been properly selected for the work they were to do. There is no question but that in this country an investment totaling millions of dollars is tied up in motors that are too large for the work they are doing.

Taking up the question of the result of low power factor to the central station and considering first the investment cost, we are all too familiar with this subject. The excess cost to the company begins with the generator and ends only with the consumer's meter. Generators, switchboards, transmission lines, substations, distribution lines, transformers, meters—in every part of the system we meet excess investment that would not be necessary if the power factor were bettered. Practically all power companies have been up against the question of poor regulation of lines due to low power factor and have either had to duplicate the lines or install synchronous condensers, and here again is excess investment. It is safe to say that a considerable proportion of the investment of every power company could have been saved if only the power factor of the power loads could have been improved.

When we take up the question of operating costs, the evil effect of low power factor is still apparent. In any number of plants it is necessary to run additional turbines to carry the load —not on account of the kw. load but on account of the kv-a. load. In many plants it is impossible to get the steam economies that might be easy of attainment if only the power factor were such as to allow the equipment to be operated at its most efficient point, instead of having to operate the equipment at small kw. load but full kv-a. load. Not only does the plant with steam generation suffer from high operating costs due to poor power factor but the same thing is true of the hydro plant. Many such plants have to operate more wheels than are necessary to carry the kw. load. During such times it is often necessary to purchase steam generated power to take the place of the power that might have been generated by the water that is being wasted by low power factor operation.

Not only are the operating costs affected in the manner outlined above but the I^2R losses at 85 per cent power factor are 40 per cent greater than at 100 per cent, and at 60 per cent power factor are almost three times as much as at 100 per cent power factor. While it may be impossible to say just what this total loss may amount to, it is safe to say that the total output of a great many coal mines goes each year to supply this excess I^2R loss caused by low power factor.

Referring to the question of the result of low power factor on the service of the central station, we all know only too well from bitter experience just what this means. Many communities are having to contend with inferior service, and many central stations are struggling to improve service on some line that has low power factor. The losses in the lines increasing at the rate mentioned above, it is easy to see that oftentimes a comparatively small drop in the percentage of power factor will make all the difference between voltage regulation that is fair and regulation that cannot be tolerated. There is no question but that of all the causes of poor service there is none that is met with so frequently as the low power factor of the consumers' load.

MR. KNOWLTON: We now come to the topic relating to new and growing applications of electricity. Mr. McKinley of Pittsburgh.

Power Factor of New and Growing Applications of Electricity

STEEL FURNACES

JOSEPH MCKINLEY: There are three types of furnaces in use at the present time:

Arc Type
Resistance Type
Induction Type.

Of these the Arc Type is the one principally used in the melting and refining of steel. Among the principal furnaces of this type in successful use in America may be mentioned the following:

Heroult
Girod
Gronwall-Dixon
Rennervelt
Moore
Greaves-Etchells
Snyder
Ludlum

These furnaces have inherently a high power factor and the effective power factor on the central station system will depend largely on the method of conducting the energy from the transformer to the furnace.

The things effecting the power factor of these furnaces are:

First: The frequency of the supply system—the power factor being less on 60 cycle than on 25 cycle current.

Second: The amount of power taken by the furnace—the power factor being less for large in-put than for small in-put.

Third: The voltage at which the furnace operates—the power factor being less the lower the voltage.

Fourth: The arrangement of the buses and the leads between the furnace transformers and the furnace—the power factor will vary materially depending on the care with which these leads are laid out—the degree to which they are interlaced and kept from the influence of magnetic material.

There should be no difficulty in maintaining a power factor of 90 to 95 per cent at the primary side of the transformers for a 6-ton furnace operating on 25 to 60 cycles. The combined reactance of transformers and secondary leads to operate at this power factor is such as to permit approximately three times normal current flowing under extreme peak or short circuit conditions with the voltage of supply line maintained, and this will be sufficient to stabilize the arc. This will usually be satisfactory, depending, of course, on the supply system. The tendency now is to supply furnaces with automatic constant current regulators which smooth out the fluctuations of current and hold down the short conditions to brief intervals. There will undoubtedly be further improvements made in such regulators along the lines of quickening their action in handling peak conditions.

Furnaces for ferrous alloys and non ferrous metals are usually constructed to meet the desires of the individual owners. In general the same power considerations pertain to them as to the commercial types of steel furnaces noted above.

Brass Furnaces

These in general are of smaller capacity than steel furnaces. There are three distinct types.

First: Resistance type such as the Bailey Furnace.

Second: Semi arc or arc resistance type such as the General Electric Furnace.

Third: Arc type such as the Rennervelt, the Snyder, and Rocking Brass Furnace.

The resistance type has a very high power factor, the heating element consisting of a non-inductive resistance.

The semi-arc and arc types require more or less reactance in the circuit to maintain stable operation. However, the furnaces are of such small size that the reactance in the leads with the amount of current flowing, will not result in power factor low enough to cause any concern. There should be no difficulty in maintaining a power factor of greater than 90 per cent with these types.

Welding Machines

There are two methods of electric welding in general use:

Arc Welding

Butt Welding

In arc welding the heat is generated by arcing the current from an electrode connected to one side of the supply line to the objects to be welded connected to the other side of the supply line. Direct current supplied through motor generator sets is most generally used in this operation. There are two types of units used in direct current arc welding:

Multiple Operator Units

Single Operator Units

The multiple unit is provided with a constant potential direct current generator supplying current for several operations at one time. For the larger capacity machines, 60 kw. and above, synchronous motors can be used to advantage, and unity power factor maintained.

The power factor of the induction motor driven sets will depend on the size and speeds of the motors used and the load at which they are operating.

The single operator unit is provided with a constant current direct current generator supplying current for one operation at a time. The average capacity of these units is 3½ kw. and they are driven by induction motors. The power factor will be lower than the multiple operator unit's, on account of the size of motors used.

Alternating current is sometimes used in arc welding, the current being supplied from the alternating current supply line through specially designed transformers. These transformers are provided with large reactance required to stabilize the arc. The power factor of such installations will be very low, ranging from 25 to 35 per cent.

Butt Welding

In this process the objects to be welded are inserted in the secondary circuit of a transformer connected to supply circuit, the heat being generated at the point of contact of surfaces to be welded. The large current values together with the reactance of the circuit produce low power factor, ranging from 40 to 55 per cent.

Mr. Knowlton: We have set the hour of 5:30 for the adjournment, and while I am sorry time will not permit of our taking up the other points outlined, which we consider very interesting, the Chairman has stated to me that if you wish to continue the general discussion for a period of ten minutes, if you make a proper motion to him, you may do so.

(Motion made, seconded and carried.)

W. T. Morrison, New York City: You have been going at this proposition at a different angle. I know of a company using welding machines which is considering making the customer put in a motor generator set to avoid this lower power factor of 25 to 30 per cent of which you have spoken. Some of the other companies are making their customers install large synchronous motors, irrespective of the additional cost, and they are not allowing them any bonus for 100 per cent power factor. There are a great many different points in regard to this synchronous motor situation. Coming down to the final point of this situation, there has been a great deal said, and people lose sight of the main fact; they talk about the prices being a little more or less and everything else, but there is no need of talking about prices when you cannot use the motors on your lines. Now, there are only one or two makes that can be used. I am speaking of ordinary circuits, of 2300 volts, where a great number of induction motors are run from 2300 volt and not from high tension lines. But in the average central station system of 2300 volts synchronous motors, except of comparatively small size, probably could not run as these motors usually take four or five times full load running current at starting.

A. G. Darling, Schenectady, N. Y.: I think we have all learned a great deal from these discussions on power factor. If we could obtain a suitable method of power factor measurement, perhaps we could arrive at some standard rate form.

Probably the oldest method of measurement in vogue is the integrating ammeter, which depends altogether upon constant voltage. That may suit a great many cases even to-day; the two single-phase watthour meters have been proving very satisfactory.

Some people have wanted to develop a kv-a-hour-meter. This has already been developed but it has its applications only in a very limited field due to the expense connected with it. It consists of a number of, perhaps six, single units, each of which is designed for a small range of power factor. When the line power factor goes out of the range of one unit, the next unit takes it up and so on. This meter could be used in installations where the power factor means a great deal.

The integrating reactive watthour meter in combination with the standard watthour meter consists of standard types of apparatus. It is a little more complicated method than the two single phase meters.

I am rather sorry that the term "penalize" has been used in speaking of the method of charging customers on low power factor. It reminds me of the days when we discussed the name "COMPLAINT OFFICE" and changed that to some other name which did not go quite so much against the grain of our customers. In using the term "penalize" you fill the customer's mind directly with something that he does not like to hear about. Some other less revolting term undoubtedly should be used.

One other point comes up in the engineering of this power factor and metering business. Probably the hardest customers to take care of are those of medium size, compelled to install condensing equipment to improve their power factor and secure a reasonable rate. I believe our power salesmen and apparatus manufacturers can use a good deal of care and judgment in not forcing the situation too hard on these customers. It may be better to improve the system power factor by securing the co-operation of groups of customers who collectively would improve their own power factor, or a group of the whole customers, in which case a charge would be made in the regular rates and the power company compensated for it by installing corrective capacity in its sub-stations.

Chairman Jones: I am sorry our time is limited. I am very much pleased with this meeting, as we have brought out a good many points.

Good Power Factor in an Industrial Plant

W. R. McLeod, Jersey City, N. J.: The economies forced on us under the stress of war have taught us many lessons on the utilization of every resource, and we will continue to check up our former wastes.

It seems to the speaker that the 100 per cent economy idea should continue to apply now, as during war times, to the central station. I would say then, that anything less than unity might be looked upon as low power factor, and the limiting point be specified, depending on conditions.

Since the common source of low power factor is underloaded induction motors, we inquire into their characteristics. Motors of this type and of sizes and speeds found in the average installation, at from three-fourths to full load have power factors approximately ranging from 80 per cent to 90 per cent.

When such a condition is found in a shop of miscellaneous motor drives, it is good evidence that motor applications have been well made as far as capacity is concerned.

An 80 per cent power factor can in the average installation be brought about by the application of proper sized motors, benefiting at the same time both customer and central station, while above 80 or 85 per cent generally requires the installation of corrective apparatus. Therefore, most central stations look upon 80 per cent to 85 per cent as a reasonable power factor demand for induction motor installations and one which inflicts no hardships.

When it becomes necessary to install corrective apparatus, correction from points below 80 per cent is much less expensive than to points above 80 per cent, and here again 80 per cent becomes a good place to draw the line. At 50 per cent power factor, 1 kv-a. of condenser capacity relieves 1 kv-a. system capacity, while between 80 per cent and 90 per cent 1 kv-a. of condenser will relieve but one-half kv-a. of system capacity.

Eighty per cent power factor, then, is a reasonable demand, but 100 per cent, the ideal, should be ever borne in mind. Under 80 per cent should not be tolerated.

Now the power sales engineer has a great influence towards the goal of 100 per cent power factor. He does not absolutely need a rate placing a bonus on high power factor, although this would help accomplish the desired end, but if he is ever alert to the interests of both consumer and producer, instead of merely obtaining a contract, he can make the capacity he is selling go much further. The following are a few of the opportunities for accomplishing results:

First—He should always bear in mind the proper size of motors in relation to his rate, because, whether the demand charge is based on a percentage of the connected load or is measured, over-motoring increases this item. Over-motoring increases the current consumption and it also wastes station capacity. These facts properly pointed out to the prospective customer should be sufficient to arouse interest in proper motor recommendations.

Second—If motor recommendations are left entirely in the hands of the power engineer, which in many cases is so, he should always bear in thought these features:

(*a*) Starting requirements of the load and the characteristics of the squirrel cage vs. the slip ring motor.

(*b*) The peak requirements of the load as to its duration and value, bearing in thought always the overload rating and breakdown torque of the motor and the application of fly wheels to the driven machine.

(*c*) The proper operating voltage so that motors no matter where located will have the proper terminal voltage.

Third—The power engineer should thoroughly understand motors with regard to their inherent characteristics. Many places can be found for the use of synchronous motors where heretofore it was thought only the induction type could be applied. In such cases unity power factor is obtained for the driven load as well as corrective features for other load of low power factor.

Fourth—Many isolated plants are equipped with direct current and in many cases it is impracticable to change to alternating current. For the reason that many machine tools require variable speed operation, and, where in other cases the cost of changing the equipment seems prohibitive, the installation of a rotary converter or motor generator set should be encouraged rather than the change, thereby benefiting the consumer and giving the central station a 100 per cent power factor load.

Fifth—Group versus individual drive should be well considered before deciding on the latter as many cases of low power factor result therefrom.

Sixth—In plants where heating can be done with exhaust steam and an engine-generator set is available for this purpose, a rotary convertor or motor-generator set can often be arranged opposite it and the load on the engine adjusted to give the proper amount of exhaust for heating. This arrangement relieves the system in winter months and fills up the summer valleys, thereby smoothing out the seasonal load curve and also making available capacity for correcting power factor.

From the foregoing points it is evident there is a wide field for the power sales engineer to investigate and in which to wield his influence for acquiring load of high power factor; and in this he needs the helpful cooperation of all departments of his company. He should know this feature of the business well, otherwise he cannot take advantage of the numerous instances offered for high power results.

(On motion the meeting thereupon adjourned.)

FOURTH COMMERCIAL SESSION
ELECTRIC RANGE

Wednesday, May 21st, 1919

The meeting was called to order by Chairman John G. Learned at 3:45 p. m.

CHAIRMAN LEARNED: In the absence of Mr. C. E. Michel, Chairman of the Electric Range Committee, Mr. Theodore Dwight will present this report.

(Mr. Dwight then abstracted the printed report.)

REPORT OF THE ELECTRIC RANGE COMMITTEE

When in the early months of 1919 this Committee submitted its report on the electric range, it submitted a report on an article which through sheer merit was smashing its way to prominence. The unfortunate conditions obtaining during the past two years stopped the advance of many a man and many an article; some have fallen by the wayside, permanently, but to the man of courage and the article of merit the stagnation was of but a temporary nature. To such the dawn of 1919 disclosed America clearing her decks and preparing for the greatest era of sound business prosperity the country has ever known.

That the advance of the electric range was checked is beyond question; that check, however, did not come from a lack of demand; on the contrary, the demand in many sections was large and insistent. In very few sections was it satisfied and the reasons are apparent.

The manufacturers were confronted with a serious shortage of materials. Government restrictions not only as to material but as to types, etc., government requirements for war work, which, in instances, made the manufacture of electric ranges practically impossible, and the mounting cost of labor and material all made it most difficult to market the product at a figure which would insure a fair return and at the same time be not prohibitive.

The power companies faced a condition wherein their market for securities was all but wiped out and money for extensions could be had only at rates of interest well-nigh ruinous; a condition where the return on energy sold for cooking at pre-war rates, which were difficult to increase, was less than attractive and wherein it was next to impossible to give service by reason of the excessive cost and lack of efficient labor.

Many sections faced a serious power shortage and practically all sections were forced to suspend commercial activities.

In the face of a "barrage" of this kind the electric range marked time, but the manufacturers are practically a unit in the statement that it did not retreat, and their reports seem to indicate that the 1918 sales about equaled those of 1917.

Manuscript of this report was received March twenty-seventh.

The distribution shifted; for instance one large and progressive company reports that in 1917, 72 per cent of its ranges were marketed west of Chicago, and that in 1918 approximately 93 per cent of the total sales were in this territory. Reports seem to indicate that the sales during the year 1918 were made in a larger measure than ever before in new localities, and more sparsely settled districts. The story seems to be that while the larger power companies slowed down in range installations, the slack was taken up by the activities of the smaller companies, and so with the resumption of our endeavors we find the electric range more favorably and widely known than it was when many of us dismissed it, temporarily, from our minds.

In the preparation of this supplementary report, your Committee has consulted the known authorities and active range men in all sections of the country, and as nearly as possible their composite views are here expressed.

We have every reason to believe that the year 1919 will be a formative one in which we will see the electric range gain a tremendous impetus. As to the section from which the demand will come, opinions differ, and they differ by reason of the fact that practically every section of the country has sensed the awakening of interest in electric cooking.

The West and Northwest say, "The most favorable section of the country for electric range business is this section; here the demand will be just what we care to make it. The West has momentum in the range business, which will gain as time goes on. The West has a higher percentage of its people under wire than have other sections of the country, a big advantage."

The Far West says, "The farmers are all more prosperous than ever before; the possibilities seem unlimited and we think that within the next few years electric cooking and water heating in this section will be almost as universally popular as electric lighting."

The Middle West says, "The business is simply waiting on the flag; within six months from the word 'go' the high peak of 1917 will be passed; the territory is a progressive one, in which the rates for electric energy make it competitive with other fuels."

From the South and Southwest comes the story that "Exceptional prosperity is here and in the making. Of course this is the most favorable section for electric cooking as climatic conditions are such that electric cooking is almost a necessity."

From the North we hear that "While a considerable proportion of our population flocked to the industrial centers of the East, the returning tide has set in. It returns to a country the backbone of which is agriculture, which has enjoyed a wonderful prosperity. This wealth is manifesting itself in building operations and the demand for electric ranges is constantly on the increase."

From the East we hear that those central stations which have experienced sharp reductions in consumption due to the stoppage of war work expect to get it back through the sale of electric ranges.

That the optimistic reports from those sections are warranted seems indicated by the report of one of our large manufacturers, who says: "Already we are receiving inquiries from central stations whose locations are so widespread and scattered that it indicates to me the awakening interest is apparently national in scope. It is logical to assume that those sections of the country most favorable to a resumption of range business will be where the development was at its highest at the beginning of 1918. On the other hand, the tone of our inquiries during the past thirty days would indicate to me that we may look for more prompt business from newer localities which have been taking stock of the more advanced situation in other sections and which are desirous of catching up with them in range development."

The policy adopted by the power companies this year is destined to play a most important part in the development of the range business.

Where the stress is such that prohibitive limitations are placed on extensions and where the cost of energy is such that it is not even approximately competitive with other fuels, the range business will be seriously affected. The power company bent on developing the cooking load should be very sure that sales policies and energy costs are as liberal as the facts justify. It has, however, occurred to your Committee that one drawback is the proneness of the public, the manufacturer and even the power company itself to feel that the entire success of the electric range depends on an extremely low price for energy and a range sales policy so liberal that it becomes a burden. We feel that we must unite in convincing the public that first cost and cost per kilowatt-hour are but a part of the story. This problem has ever been one to be mastered by the electrical man, whether his endeavor was along the lines of lighting, power, transportation, heating, or, as now, cooking.

The coal oil lamp, the gasoline engine for the generation of power, the horse car, are still with us, but how few take them seriously. Electrical industrial heating is at death grips with the older methods, and electric cooking, the youngest member of the family, is showing indications of a vigorous and extremely rapid growth. We must also recognize the fact that gas rates have been advanced in many cases, more than have those for electricity, and indications are that in the future gas rates will be higher in comparison with electric cooking rates than has been the case in the past.

While it is probably true that the attitude of the power company is of paramount importance to the range business of 1919, second only to this factor is the policy of the manufacturer. In some instances he is still seeking a settlement of claims arising from his war-time activities; export business on a prepaid basis has become most alluring. Experience seems to indicate that war-time stress has tended to lower the quality of his product in heating units particularly. To the manufacturer we must leave the problem of supply, quality and first cost. He should be very sure that during the next twelve months his costs are just as low and his quality just as high as the conditions justify, and he should at all times bear in mind that ultimately the electric range business will be no better than the heating units supplied.

It is hardly necessary to draw attention to the sharp increase in the demand for heavy duty electric cooking and baking equipment. The best evidence of this demand is the fact that whereas manufacturers of kitchen equipment were formerly reluctant to anticipate such a demand, these same manufacturers are now aggressively entering the field.

The experience of the United States and Allied Governments in the preparation of food in large quantities by electricity has been of rare value to the industry. Many thousands are familiar with the wonderful success that has been achieved along these lines; we must capitalize this and do it now.

No attempt has been made to revise in *toto* the report issued by this Committee in 1917. The need for such general revision did not seem indicated and the following reports from Sub-Committees should in each case be considered in connection with the 1917 report.

Respectfully submitted,

C. E. MICHEL, Chairman.

REPORT OF SUB-COMMITTEE ON SALES METHODS AND COMMERCIAL RECOMMENDATIONS

The most critical period in the merchandising of electric ranges has passed since the 1917 report of this Committee was submitted.

Considered by many as an experiment, by others as a luxury, and looked upon by practically everyone as something which must prove itself worthy of all the claims made for it by enthusiasts, the electric range came through the period of trial stronger than ever, its value proved, its reputation as a substantial load builder enhanced.

True, the sale of ranges has fallen off to some extent during the past two years. This falling off was due not to a depreciation of the value of the range as a load builder but to the impossibility on the part of central stations to obtain new capital to finance the necessary transformer, line and wiring work at a rate which was not prohibitive.

In some localities the demand for ranges was so insistent due to good work which had been done in introducing them, that it was impossible to discontinue their sale. To cut down the cost of installation, ingenious methods were employed. One station reports that in a given locality where twenty-five ranges were ordered by customers, practically all the materials needed for installation were obtained by taking down unused services at other locations. A study of transformer loading on this central station's lines disclosed the fact that many transformers in use were not fully loaded, and that by a better distribution of them sufficient transformers already installed could be obtained to take on the ranges in question.

Another central station which has sold hundreds of ranges, after a short study found that it would be possible to install more than 2,000 additional ranges in the localities where ranges had already been installed without materially increasing line or transformer costs. Sales efforts were concentrated on these 2,000 prospects with excellent results.

Many other stations required the range purchaser to pay part of the line, transformer and installation cost; others asked that interest-bearing securities to the amount of the estimated installation cost be purchased.

The very fact that those central stations which had considerable experience with electric ranges during the past, tried so hard to devise ways and means to extend their sale during the war, tended to convince other central stations which had preferred to wait until the range business had been more thoroughly tried out, that this business is really valuable. Thus we find that scores of central stations which heretofore have discouraged the sale of ranges are today planning extensive range campaigns.

This is especially true of central stations located in large industrial centers where immense quantities of power have been sold during the past few years for munition work. In one such city, the energy consumption has decreased more than 20 per cent since early in November, despite the fact that December, January and February are the "long evening" months. The central station in this city expects to get back this load through the sale of electric ranges.

Other industrial centers were more fortunate in that the heavy power load which had been developed during the war was not cut off so suddenly. Practically every central station in these centers is turning to electric ranges as the best medium for disposing of surplus energy when war manufactures cease.

Not the least surprising development in electric cooking during the past two years has been the extensive sale of heavy duty, or hotel and restaurant equipment. It is safe to say that not a single hotel or club built or building in any of the larger cities during the past two years has overlooked the possibility of cooking and baking electrically. Many of the finest restaurants in the country now are doing at least part of their cooking and baking electrically—many have complete electric kitchens, and are advertising the fact. Many bakers have investigated electric ovens and are installing them—a chain of electric bakeries now is being established in every large city in the country.

The extensive introduction of this heavy duty apparatus has been due not to the fact that electric cooking is novel and new, but to the fact that it can actually be demonstrated that it is better and cheaper, and that an electric kitchen or bakery is much more sanitary.

The sale of this heavy duty apparatus cannot but help to extend the sale of domestic electric ranges. Central stations in cities which have one or more restaurant and bake-oven installations report increasing interest in electric cooking, and many sales of domestic installations can be traced directly to the fact that the head of the family became interested through the installation at his favorite club, hotel or restaurant.

Because of the necessity for curtailing materials and finances, no really new sales plans have developed since the 1917 Range Committee report was presented. Many of the inducements offered in previous years, indeed, were withdrawn during 1918.

The plan of offering to sell ranges on deferred payments and the plan of allowing trial periods were withdrawn by practically all central stations. Most merchandisers are of the opinion that the plan of selling on deferred payments must be reestablished on terms more liberal than those warranted during the year 1918, before the sale of ranges will reach a satisfactory volume. It is doubtful if the plan of giving trial periods will be revived, excepting in localities where there has been little or no range activity.

The spread throughout the country of the food and fuel conservation idea should be made the most of by those interested in the development of the electric cooking load. Rarely has an industry been so favored and helped by a national propaganda as has ours. The necessity for economy of fuel and food has been brought home through every possible medium throughout the country. It has been sufficiently proved that electric cooking is more economical of fuel and food than any other method, and this fact should be capitalized, not only by salesmen, but in advertising.

It is evident that more national advertising of the advantages of electric cooking is to be done this year and next than ever before. Several of the larger manufacturers have plans for national publicity which will make electric cooking a household byword. It is essential, of course, that this advertising be followed up locally if real benefit is to be obtained from it.

During the two years which have elapsed since this Committee made its previous report, the manner of service on ranges has been given special consideration by central stations. The experience of those central stations which have a large number of ranges installed will be of real interest and value, and opportunity should be given at the Convention for a full discussion of this important phase of the work.

The Chairman of this Sub-Committee has obtained a mass of data from various parts of the country which could not be worked up into report form in the time allotted. These data will be available for answering questions, etc., on the floor of the convention.

From reports received from every section of the country it is safe to say that the enthusiasm for electric ranges has never waned; rather, it has increased, and there is every indication that when present artificial barriers are removed the electric range will come into its own.

REPORT OF SUB-COMMITTEE ON STANDARDIZATION

The Sub-Committee on Standardization suggests that—

(a) The recommendations on models imposed by the War Industries Board serve as a reasonable guide.

(b) It is desirable that all parts should be easily replaced from the front without the necessity of dismounting the range.

(c) A different colored wire be used for the neutral, as the general practice of tagging the neutral is unsatisfactory.

(d) A fused receptacle with plug of double T type be provided for the plugging in of practical accessories.

(e) Where the mechanical construction of surface burners is such that food, either in liquid or solid form, may fall into the area below, the installation of a drip pan is desirable.

(f) Lead wires to the switch-board should always be of solid wire rather than stranded type.

(g) We now believe that the separate fusing of units should be universally adopted.

(h) That the National Electric Light Association should promptly provide for contact between the Electric Range Committee and the Board of Fire Underwriters, which is at this time working on electric ranges.

REPORT OF SUB-COMMITTEE ON WATER HEATING

A great deal of time and attention was given to the preparation of the 1917 report on electric water heating. It covered the subject in a thorough manner, and it is suggested that those interested in the subject study that report. The situation at present is much the same as at that time, excepting that the number of stations giving consideration to the water heating problem has greatly increased, hence it has taken on more of a national aspect. There have also been a few new developments in the water heater line, such as a sheath wire "Plastic" type heater which clamps around the base of the boiler; the object being ease of installation and absence of clogging where heaters are used with water carrying a large amount of solids in solution which deposit under high temperatures. It is claimed that this type of heater has an efficiency of approximately 80 per cent. Inasmuch as it is usually of low capacity and clamped to the base of the boiler so that the entire boiler must be heated before hot water can be drawn, it is applicable only where heaters are left in circuit continuously or controlled with a thermal switch. It is developed especially to meet the condition in the Northwest, where the water carries considerable lime and other solids, and where the companies are making a flat rate for water heating.

Another development has been a very rugged bayonet type heater with a unit of sheath wire formed into a single bayonet. This unit can be inserted in a pipe and used as an external circulation heater or directly into the bottom of the boiler as an immersion heater. Or the unit may be inserted in a specially insulated tube extending through the interior of the boiler from the bottom nearly to the top, producing an interior circulation type heater, which in reality would seem to be the ideal method of water heating in the case of a storage system, since it possesses the high efficiency of the immersion heater with the advantages of the circulation heater. One objection to this type is that a special opening in the bottom of the boiler is required for inserting the pipe. This disadvantage could, however, be very easily overcome by the use of a long small diameter heater which could be inserted in an insulated pipe sufficiently small in diameter to go through the standard opening in the top of the boiler, then inverting the boiler, which would give two openings in the bottom and one in the top for drawing off the hot water. The efficiency of this type of heater, aside from the boiler radiation losses, would be practically 100 per cent, and the service ideal when operated with an automatic thermal switch.

Since the 1917 report was issued, there has been developed a carbon electrode circulation type heater similar in design to the instantaneous heater described in that report, and experience has proved it very satisfactory under certain conditions. Of course, due to the fact that it is simply a water rheostat, its operation depends upon the conductivity of the water, which in some cases is low and in others high. It has a great advantage in being practically indestructible, and it cannot be burned out due to lack of water in the boiler.

Since the development of reliable thermal control switches, there seems to have been a material increase in the popularity of the thermally controlled heater, at least on the Pacific Coast, and there is no doubt that the use of heaters of this character will continue to increase in greater proportion as the rates for water heating are made more attractive, so as to allow of a supply of hot water being maintained continually. The ideal service and that which appeals the most to the housewife is a continuous supply of hot water always available. Many persons have been deterred from fully appreciating the advantages of the electric range due to the fact that they were unable to maintain always a supply of hot water. This is a very important matter and one which is apparently overlooked by many central stations that are encouraging electric cooking. There have, no doubt, been many new developments in the water heater line other than those recorded above, but they have not been brought to the attention of the Committee, and owing to the extremely limited time allowed for the preparation of this report it has not been possible to unearth them. The Committee has received reports from very few stations on recent progress in water heating. However, it is believed that the matter has been given more thought in the past two years than ever before, although owing to the war conditions, new business has been materially handicapped; but even so, it is known that some companies have added considerably to their water heating load. A large proportion of the increase is apparently voluntary, since very few if any of the stations have been seeking new business the past year. The following are reports from two large central stations on the Pacific Coast:

One company, reporting 724 water heaters in use January 1, 1919, states, "Of these, 117 were sold during 1918, without concerted sales effort. War conditions compelled the practical abandoning of sales efforts, and the fact that 117 consumers sold themselves is an indication of the success of domestic electric water heating and indicates what may be expected when we get back to the pre-war basis. Most, if not all, of our sales of water heaters last year were to consumers already using ranges and therefore the investment and installation were very moderate. We believe every user of an electric range is a water heater prospect. In putting into use over seven hundred heaters we felt we were trying out the proposition more or less experimentally as it were, as during our earlier efforts we did not find the water heating business entirely satisfactory. Some installations were made where the water carried so much salts that the heaters did not operate satisfactorily and in other ways were subjected to abuse which the elements were not made to withstand, and for a while we discontinued taking orders for water heaters. It followed that heaters installed under impossible conditions were taken out, and wornout elements in places where heaters should work were replaced with sturdier ones as they were developed. Heaters of a new design have become available and through this evolution we feel that our electric water heating is now on a better basis. Troubles have been minimized to the mutual satisfaction of the consumer and ourselves. Even in the face of the high cost of operation there is a marked demand for electric water heaters.

"We have a combination schedule for lighting and heating service supplied from the same meter to residences as follows:

"(1) For all energy in residences and suites of apartments supplied through one meter where an electric range is installed for cooking purposes:

Size of House	Consumption	Rate
5 rooms and less....	First 20 kw-hr. per month	Established lighting rates
6 to 7 rooms........	" 30 " " "	" " "
8 rooms and over....	" 40 " " "	" " "

"(2) For all energy used per meter per month in excess of the number of kw-hr. as designated under section one, the rate is 3.5c per kw-hr.

"(3) Where an electric water heater is installed and used for heating water in addition to the range, for all energy used per meter per month in excess of the amount supplied under section one plus 100 kw-hr. under section two, a rate of 2c per kw-hr., minimum charge $2.50 per month. Under this schedule it is expected that water heating will be on the basis of 2c per kw-hr.

"We expect a large increase in our water heater sales when conditions get back to where they were in 1915 and 1916. In the meantime, although the prices of heaters remain high, there is a good healthy demand in sight."

The second company reports 346 water heaters in use January 1, 1919, 71 of which were installed during 1918 with but very little sales effort. Most of these were sold to new consumers who were installing electric ranges, it having been the practice of this company ever since going into the range business to advise its consumers to install a water heater with the range. As a result, 60 per cent of the range consumers are using water heaters and an effort will be made to induce the other 40 per cent to install them as rapidly as possible. The report goes on to state, "Our experience with water heating has been satisfactory from the beginning. It is true there have been some troubles due to the construction of the heater and in some localities on account of solids in the water, but nothing of a serious or discouraging nature has ever developed to shake our faith in electric water heating. We firmly believe that electric water heating is quite as essential as electric cooking, and that from the viewpoints of both the consumers and the central station it is of equal importance. For the consumer with an electric range a supply of hot water is very necessary. If this is not supplied by an electric heater, some other water heating system will have to be installed. In most cases the old coal or wood stove with its water coil will be retained, which is a disadvantage since it occupies space in the kitchen and is a source of continual trouble and dirt as well as a great discomfort during the warm weather, the final result being that the consumer has not secured the ideal conditions expected when the electric range was purchased and is sometimes sorry so much money has been tied up in the range when so little added comfort and lessened work have resulted. For the company, since the water is heated with other fuel, there is a continual loss of good revenue which could have been had if the water heater had been installed with no additional expense other than the cost of the energy.

"There is also a considerable demand for water heaters in barber shops and soda fountains. A number of such installations have been made and they have proved universally satisfactory.

"The following tabulations will convey an idea of the returns this station is getting:

Service	*Avg. Kw-hr. per month*	*Avg. Revenue per month*	*Avg. Rate per Kw-hr.*
Range and water heater....	225	$6.68	2.97c
Range only...............	118	4.19	3.56c
Water heater only.........	196	5.38	2.74c

"The energy is supplied under a sliding scale. The first 30 kw-hr. per month per active kw. of connected load 4c per kw-hr.

"The next 90 kw-hr. per month per active kw. of connected load 2c per kw-hr.

"The balance 1½c per kw-hr.

"The active load is determined by taking the first 2 kw. of connected load as 100 per cent and the balance at 50 per cent, thus a 6 kw. range would be rated as 4 kw. active load. The minimum is $24.00 per year on a yearly contract, or $2.00 per month if no contract is signed.

"Lighting is not supplied through the same meter, and to keep down the active load, water heaters are usually connected through a double throw switch with the range, in which case they are not counted as active load.

"There is considerable new business in sight and it is believed that just as soon as conditions become a little more stable it will be possible, by putting forth the pre-war efforts, to add materially to the range and water heater load. In fact, it would seem that the business is now just established and that the possibilities are unlimited."

Respectfully submitted,

C E Michel, Chairman

John Abbink	C N Lewis
J P Clayton	B S Manuel
J D A Cross	J H Risser
Theodore Dwight	J F Roche
C E Greenwood	R B Snyder
George A Hughes	Adolph Strauch
Hartwell Jalonick	F A Wright
J F Killeen	H E Young

Chairman Learned: Just prior to coming into this room I thought possibly we would have to work up a list of names for discussion, but I am informed by Mr. Killeen of Chicago, that about twenty-two people have some very exhaustive discussion on this subject, and I will call upon Mr. Killeen to lead the discussion and take charge of it. Mr. Killeen.

J. F. Killeen: Ladies and gentlemen, it is now after four o'clock, and we must get out of here at six. The water heater discussion will take at least forty-five minutes, therefore, we will try to be as brief as possible. First of all I would like to move, Mr. Chairman, that we give Mr. Dwight a vote of thanks for his interpretation of Mr. Michel's report, and I so move you.

(Motion duly seconded, put before the House and unanimously carried.)

Mr. Killeen: Now, Mr. Chairman, we have less than two hours to discuss what to my mind is one of the most important developments in the electric industry. We date back perhaps twenty years, or twenty-five years. We have been through the development of the railway motor, the mazda lamp, and various other commodities. Today we are engaged in marketing a device which is a problem, to say the least. The consumer, customer, if you please, buys this product at what he thinks is an extremely high price. The central station markets this product as an investment. The manufacturer today does not make a nickel in the promotion of it. But the big future, the broad vision of it, leads us on to what can be made, by intelligent cooperation and direction, a successful future. There is a field today for the jobber and the central station and the consumer which we can utilize and should vigorously promote. Of course there are obstacles and we must face them. We must solve these problems together, in this contact here, the National Electric Light Association—the Jobbers Association, the Manufacturers Club—we must all tie in together. With your permission, Mr. Chairman, we will approach the discussion in this manner, and it will give me great pleasure, sir, if you will ask Mr. J. E. Davidson of Omaha to tell us something about the electric range from the central station point of view.

CHAIRMAN LEARNED: I call upon Mr. J. E. Davidson.

J. E. DAVIDSON, Omaha: Mr. Chairman, I can well recall what I think was the first electric range meeting held in this country. It was during a convention of the Northwest Electric Light and Power Association at Portland, Oregon, about six or seven years ago. We had considerable discussion at this meeting, because some of the companies had just started the range business and we were very much interested in it. We could talk a little about theoretical things and a great deal about what we expected to do. Today the situation is very different. A great many companies, particularly in the western part of the country, have had a lot of practical experience and no longer have to discuss the subject from a theoretical point of view.

I think the electric range has been under discussion for from fifteen to eighteen years. Just about the time that sentiment was created in favor of its development conditions came about, on account of the war and increased costs, that acted as a barrier and it did not gain favor as it would otherwise have done. Just about the time that the price of ranges would have gone down so that we could handle them—maybe as the gas industry has handled the gas range—the price of metal, labor and everything else went up and, of course, it was necessary to increase the cost of the already high priced range. I think there is considerable doubt as to whether or not we will have a rapid development in the electric range game unless there is a reduction in price, and it does not look as though there would be a reduction in price for some time.

I have made a few notes on things I think we ought to consider in taking up this very important subject. First of all, I think a great deal of attention should be paid by the central station sales force to the education of the public in the types of ranges it should use. I think in most instances the central station has carried just one or two types and has put into the customer's home any range it could sell, just for the sake of selling it. Little or no attention was paid to whether or not it fitted the conditions in the kitchen, space, etc.

For some time to come, I think, we must consider the electric range as though we were in a period of development, and do a great deal of educational work. The range people say that anyone can cook on an electric range who can cook on a range using gas or coal. This, really, is not true in the strictest sense. I think a great deal of attention must be paid to teaching a housewife or maid its proper operation, especially as it pertains to the economies that can be effected as compared with gas or coal. The most common complaint in teaching a person to cook with an electric range is its slowness, but that objection can readily be overcome with patience and careful instruction.

There is no question but that the electric range has a wonderful field. I predict that eventually the electric range will be our primary load, just as the power business or motor load is our primary business today; and just as the gas range has turned out to be the main business of the gas companies, gas lighting being practically entirely displaced by the tungsten lamp.

CHAIRMAN LEARNED: I call upon Mr. Greenwood.

C. E. GREENWOOD, Boston: Boston started in the electric range business six or seven years ago, but we could hardly say that we were merchandising electric ranges. It is less than four years ago that we actively started range promotion. Selling the idea of electric cooking was the vital feature in the development of our range load, and the range itself was a means to an end. We kept on with development until the time war was declared, and, like most of the other central station companies, the difficulty in getting money at a reasonable figure for service extensions, retarded our range development. We had people coming into our store asking for ranges. In fact, we sold about 150 ranges last year and we did not expend one cent in advertising of any kind. We turned down about 200 more sales because of cost of service supply.

Perhaps this shows better than anything else the progress made in the selling of the idea of electric cooking. The cooking load can be developed if the central station believes in it and there is active cooperation on the part of the manufacturers.

We have no hesitation in believing there is a great future in electric cooking. The management of the company is now more liberal in its expenditure for service supply. During the war we took a reasonable limit of $150, but that amount in service did not mean a great deal in Boston with high prices of labor and material. We would not make an extension even of one pole.

Range development will, without question, broaden. The manufacturers are cooperating to promote the range sales in many cities. In New England we note this growth. In a questionnaire recently sent out to 124 central station members we had a 70 per cent return and found that there were approximately 700 ranges in use in the smaller towns, in addition to 2000 or more on the lines of the Boston Edison Company.

The future of the range business will be in its broader development by reason of other central stations introducing electric ranges in their territory. This represents one problem before commercial men today, but I believe that, judging from our experience in Boston, they need have no hesitation in making a start.

CHAIRMAN LEARNED: We have heard from men engaged in the central station industry, and it is fitting that we should hear from the manufacturers, so I will call upon Mr. George A. Hughes, who I am told is the father of the electric range business.

George A. Hughes, Chicago: Mr. Chairman and gentlemen, as I was sitting looking over the large number assembled at this particular meeting, my thoughts went back seven or eight years to the first meeting we had—I think there were two of us there—and it certainly is very gratifying to see the interest that is displayed.

The manufacturer of electric ranges during these past few years has gone through a rather trying period, as almost everyone else has. The business, of course, was more or less killed last year due to the war conditions and the inability of the central station to put on the range load due to the high cost of line materials and everything that went into the installation. However, this year has opened up in splendid shape, and our company sold during the lean months, January, February and March, more ranges than we sold in the entire year of 1918.

A great deal has been said about the cost of ranges and I presume many of you would like to hear something on that particular feature. I cannot offer any hopes so far as this year is concerned of any reduction in prices. The cost of materials is just as high as it was last year, and labor is somewhat higher. But I can assure you that when conditions warrant prices will be reduced.

On that matter of price, I think in selling the electric range today we should dwell more on the *idea* of electric cooking than on the price of the range or the comparative cost of operation with kerosene, gasoline, gas or coal. Today the manufacturers of washing machines are overwhelmed with orders for machines at one hundred and fifty dollars, which a few years ago sold for a fraction of this, but the idea of electric washing has been "put over." So the idea of electric cooking can be sold, the price is secondary. The electric range will probably never be able to compete in price with the gas range or the gasoline stove; the heating elements on the electric range today cost more than the entire cost of the gas range. In speaking of price, I want to call your attention to the fact that the gas range has been greatly increased in cost and the electric range has not increased in any proportion to it. I know of one particular gas range that a salesman has told me had increased 100 per cent. Last year the manufacturers did not increase the price of ranges in proportion to the increase on other appliances, because the sale was practically killed due to the war situation, and the matter was, therefore, not important.

I can look to the future with only the greatest optimism as far as the range business is concerned. I believe today it offers the greatest opportunity to central stations for increasing their load. I recently saw a report on fourteen hundred ranges with an average income of $4. When you compare that with the average lighting customer's bills of $2, there can be no question as to the advantage of the electric range from the central station standpoint.

I came, however, to listen to the central station men's version—they really know more about the electric ranges than we as manufacturers do because they are on the firing line. I want to thank you for your kind attention. (Applause.)

Chairman Learned: Mr. R. E. Sard, Albany.

Mr. Sard: Mr Chairman, I have been away for about a year and a half and therefore am not competent to talk of conditions during the war. It seems to me, looking at it now from the point of view of a man who has been out of the industry, that electrical cooking is no longer an experimental, but a commercial proposition. The ranges now are practical. We could not say that five years ago or three years ago.

We have heard talk about "price." I mean by "price" the cost of the operation and the cost of the appliance. To my mind both of those things are absolutely secondary. Suppose for a minute we go back to first principles. You could have in your house a wooden tub set on a table, and a bucket of suds and you could probably wash your clothes. If you were living in certain districts in the south where you could get colored servants you might be able to get a laundry woman. The total cost of the installation might be about three dollars and ninety-nine cents. But would you be satisfied with it? Could the customers that are used to running water and tubs be induced to use the old wooden tubs? Of course the answer is "No." On the other hand, they are willing to put in plumbing in a house. They are willing to put in expensive tubs. Why? Because of the increased convenience.

Likewise, in South America and Mexico they do their cooking outside of the building, using two bricks and a piece of tin on top, or in a stone oven where they build the fire, and then stick the cooking on it. But you could not get people to cook that way in this country. Under certain conditions the coal range is still used, displacing more primitive methods, but the difference in cost between the coal range and the old brick fireplace does not enter into the proposition at all. People want a range. They feel they must have a range, almost regardless of cost. In the same way there are certain conditions where the electric range is almost a necessity. Even during the war times there were lots of people who, if they could have held that precious cook, would have paid five hundred dollars for a range. Of course that is an exaggerated example, but there were lots of people in this country who would have been only too glad to spend this sum.

The companies must decide for themselves whether the sale of electric ranges is worth while under their own particular conditions. Where the combination companies are getting their output of gas up to the limit with their present investment and at the same time have a surplus of electric power, the value of an electric cooking load is clear. They can put in electric ranges with a comparatively small investment for the services. On the other hand, there may be other conditions where it may not be advisable from the electric company's viewpoint. I am not going into that discussion. The main point is that electric ranges should be put in and their sale should be pushed where the economic situation demands it. For example, I have an electric range in my own house. I am five miles away from the gas lines, and oil stoves would not answer my requirements. I have a coal stove also, but it does not answer the requirements, particularly during the hot weather. There is nothing to it. I must have that electric range and no other type of range would now satisfy my requirements.

With reference to the present mechanical perfection of the electric range, I can say that I rented my house for two years, and have never heard from that range. I know other people who have had the same experience.

It seems to me, summing it up, that the chief obstacle right now to the rapid development of the electric range business is the state of mind in the electrical industry. We ourselves have gone ahead and done business although some have said there was none, and I know other manufacturers have gone ahead during this reconstruction period. The electrical range business will also go ahead, if you will only send your men out and put your power behind the campaigns. It is the state of mind that is putting on the brakes, and once you remove this drag and put the power on the job, it is going to be done before you know it.

CHAIRMAN LEARNED: Mr. Dan Hegarty will give us some of his experience.

DAN HEGARTY, Boulder, Cal.: So far as electric ranges are concerned, I think we have developed an electric range load as large as any one company in the country. We supply the territory in Northern Colorado outside of Denver, with the exception of a few towns, and including a large stretch of rural territory.

In southern Wyoming we furnish gas and electric service in the City of Cheyenne. Electric wires cover all the town and gas service is supplied only in the well built up or congested district. We found from an economic standpoint that it paid us to push electric ranges out on the electric lines in the territory where gas mains did not reach, simply to keep from putting in the gas mains, as every one who operates a gas company knows that in the last year the installation of gas mains, not only the labor cost, but to get the pipe, has been a hard proposition; this has been done to prevent duplication of service.

Now, the electric range load is a big proposition, especially with the daylight saving law in effect. Of course, when the daylight saving law is not in effect, persons who prepare their dinner about six or seven o'clock p.m. run in on your peak load, also now that the working hours have been shortened to eight hours, in a great many industries, the dinner preparing time is taken off your peak load similar to the daylight saving.

To show what we think of this business and how it can be secured when properly solicited: We have over 250 electric ranges in the town of Loveland—with a population of about 3500—and vicinity, and are putting in 40 more this month.

During the period of the war we were held up on delivery of electric ranges but now that we are able to get prompt delivery, we have again opened up our electric range campaign.

One of the big fields for electric ranges is in serving the rural communities. Along the transmission lines where the installation cost is high for the returns we get, we charge the consumers for the lines and we repay them for the cost of these installations in rebates of 25 per cent of their monthly bills, over a period of five years. At the end of five years the company owns the lines even though there is yet a balance to be rebated to the consumer, as 25 per cent of his bills must in five years amount to the cost of electrification or he loses the difference. In case the farmer does not wish to furnish the transformer, we install it and charge him ½c. per kw. per month, for the rent of it. As soon as an installation is made, solicitors go out and interview the consumer's wife with a view to selling electrical appliances, especially electric ranges. They tell the farmer's wife that her husband has a tractor to plow his farm and an automobile to go to town in, and yet she cooks by the old methods over a stove when wood is scarce and coal is high.

In the rural district the rate is a sliding scale starting at 7c. per kw-hr. for cooking. I contend that the idea that we have to sell current cheap for cooking purposes is all wrong. When our rate for cooking purposes was lower we did not have as many consumers on the line as we have today, now that our rates are considerably higher. You will find it is a great deal a matter of educating the people. We have electric range demonstrations in all the towns and at the grange meetings in the rural districts. At these meetings we give cooking demonstrations, especially to get the housewife interested and then she will keep her husband agitated until such a time as he buys her a range.

If a range is purchased, as a rule they get other electrical equipment also, such as a washing machine and other electrical appliances.

I wish to say a few words in favor of the electric range manufacturers. In the last few years they have perfected ranges so they now give very little trouble; in fact, we have more trouble with the washing machines than with ranges, as people do not understand loading the washing machines.

We find that the range load is a very profitable load and one which we wish to secure. We had a sweeper campaign on some weeks ago and as we could not get deliveries we turned the solicitors on to the range business. However, it is a mistake to take this business on at too low a rate as it is only a case of educating the public as to how to use a range. Take a coal, wood or oil range, according to the price of coal and wood in your community, and put it alongside the electric range. You can then prove the cost of operation of each; that is the way that we make our demonstrations.

So far as gasoline is concerned, the danger from it and the trouble of having it delivered to the rural districts make it almost prohibitive, and since its price increased so greatly it is cheaper to cook with electricity at 15c. per kw-hr. than gasoline at 28c.

CHAIRMAN LEARNED: We have almost reached the utopia of the central station business and therefore I am going to call upon Mr. M. S. Seelman, of Brooklyn, to add something to the discussion.

MR. SEELMAN: It may possibly be that in considering that some of you gentlemen have "range" sickness I may give evidence of the fact that the trouble is in me rather than in you.

There is no doubt from the development of the electric range business—speaking generally, however, gentlemen—that there is a field for it, a big field for it, a growing field for it, but before that field can be reached in many of the big cities, before it can be universal in the sense that the motor is universal today, you have got to go, and we have got to go, a very long distance, it seems to me. Take the community that we serve, for example, we couldn't begin to justify, in spite of everything you have said, —and in spite of everything you have said about it not being a rate question, it is in a community like ours very much a rate question—we could not begin to justify a rate at which we could get any large amount of satisfactory range business. The establishment of such a rate might be very embarrassing. We are subject to public service regulation, and we do not feel in a position to attempt to justify a rate at which we might obtain range business on any large scale. The psychological moment has not arrived yet in our town to try for it. The rate under which a range would now operate would run from eight cents down to three cents, with an average of possibly six cents. I put myself in the position of the average Brooklynite, and I say, "Seelman, would you buy and operate a range under those conditions?" and Seelman says "No." My family is in the same position as the average family in Brooklyn. We have both a coal and gas range. My gas bill for efficient, satisfactory gas cooking amounts to about four dollars a month. I do not believe that an electric range under these circumstances, with its first cost and the rates I have mentioned, would be an attractive proposition to me, and if it would not be to me, how could I expect it to be to others, and, as I say, I believe it would be an embarrassing matter to attempt to fix a rate at which the range business would be available to us. Now I realize that is a local situation. It may not apply in other communities. There are times when steps can be taken, and the wise business man, it seems to me, knows the right time to take those steps, and in communities such as ours I really do not believe the right time has yet arrived. I may be wrong, but that is the way I feel about it. (Applause.)

CHAIRMAN LEARNED: Our time is getting short. I call upon Mr. A. A. Anderson of Albany, N. Y.

MR. ANDERSON: Because our company has a good brand of gas at a very cheap rate, we have not gone into the electric range business much until lately, when we picked up a lot of outside small towns and villages, and started to put the electric ranges in on the farms as a matter of economical cooking. We found, just as one of the other speakers said, that it was a matter of education. We sell the current on our power rate. We have two rates, one for power and one for light, which bring house bills down around the neighborhood of between four and five cents a kilowatt-hour, and the bills run, in that neighborhood, between five and six dollars. The people all seem to be very well satisfied and a great many of them in the country districts are using the electric ranges. The other day a lady came into our show room and bought two electric ranges for city use. There are quite a number of ranges in the city, but this was rather a new one on us, and the salesman came to me and wanted to know if I knew anything about this woman. I said, "Yes, she is all right, give her anything you have. What does she want?" "She wants two ranges. She has gas ranges but she wants electric ranges because she doesn't like the smell of gas, and she thinks it is making her doctor's bills bigger than they ought to be." She had a two apartment house, and was going to put an electric range in her own apartment and one in the other apartment, and insist that the tenant use it. We don't charge anything for services, so customers have two meters, one for power, the other for light. If they want to use the cooking rate they get it on the power meter, that gets us out of trouble. Some people have special rates, three cents for ranges. We have dodged that by sticking to two rates, one for light and one for power.

A few years ago I was at a meeting one night when a new electric range was being initiated, and the manufacturers were all standing around patting themselves on the back about making a wonderful range. It was a wonderful range all right, I will allow that, but they said that they had finished the job, and now it was up to the central stations to get the price of current right. I didn't have anything particular to say about it at the time because it seemed to me that the manufacturer was going to make the same mistake that the incandescent lamp manufacturer made a great many years ago, making the same remark that it was up to the electric companies to get the prices right. The price of electricity has nothing to do with it. It has been demonstrated in the lamps. The tungsten lamp has been brought out and the price of light has been brought down by reducing the wattage per candlepower from three and a half watts to one and a quarter watts and below, equivalent to just that much cut in the rate. As a matter of efficiency the range manufacturers must do identically the same thing if they are going to popularize the ranges. You can educate the people as much as you like, but as Mr. Seelman says, you have got to give them something that is going to be reasonable, practical and economical, or they are not going to use it generally. The electric range is fine. I have one in my house in combination with the gas range, and use them both. There are certain stunts you can do on the electric range that my family would not think of doing on the gas range. The gas range will do other things that at present we can't do on the electric range. The electric range is not right. It must be made to cook as quickly as the gas range, and it has got to be made to do the work as well as a gas range. It can do a lot of things better than any gas range. The electric oven has it all over gas ranges, doesn't burn things up, and a gas range does. A fowl cooked in an electric range tastes entirely different from one cooked in a gas range, even though it is our gas, and it is, as I told you, particularly good gas. That is about all I have to say. (Applause.)

CHAIRMAN LEARNED: Mr. J. Paul Clayton, Central Illinois Public Service Company, Mattoon.

MR. CLAYTON: I have been very much pleased since coming to Atlantic City this time to note the great change that has taken place in the attitude of most central station people toward the electric range. About two years ago when the Electric Range Committee was holding its first meetings, a great many companies did not think the electric range was any good and they were not going to have anything to do with it unless they were compelled to. More and more of them are being compelled to, but more than that they are coming to it because they find it is about the best field left. Mr. Dwight tells me that out of twelve thousand five hundred communities in the United States which are receiving electric service, there are now cooking rates of five cents or less in some forty-six hundred communities, or about one-third of the total number. I think there is no question but that every electric company with a twenty-four hour service, at least in places where gas is not available, should have a rate for cooking at which it is possible to obtain cooking business. I don't mean by that a three cent rate, but a rate, according to the locality, with its own competitive value as compared with other fuels. I think that if a central station serves a community in which there is no such convenience as gas available, and it does not offer cooking service in its field, it is serving only a part of the field that ought to be served.

I do not agree with Mr. Seelman in his fears about the rate question. In Illinois we had to meet that question before the Commission, and before it was up officially we were rather dubious about the Commission's attitude toward it. The cooking rate is in exactly the same position now, in my judgment, as power rates were when they were first established with relation to lighting rates. When lighting rates were first established they were supposed to carry the burden of the business. They were supposed to support the company entirely. In order to get power business there had to be offered a rate that was competitive with other means of producing power. You made such a rate—it didn't have any relation with the cost of the service as regards the total cost of the service—it was what has been called an off-peak load. The revenue derived from the power business paid the additional operating expenses, and when the fixed charges were taken into account you were getting into a better total earning condition. You took it with this understanding and you felt it was all right. Cooking is in exactly that same position.

Speaking particularly to Mr. Seelman's objections, most power rates are in no more defensible position today than they were when they were first established as far as paying the total costs of the service was concerned. Very few companies had power rates. Power cannot be sold for much more than the comparative cost of production in the same territory. The same is true of cooking. You can't sell cooking for nine or ten cents, for electric cooking can't be made a success with any such cost of energy.

Speaking of the conditions in Illinois with which I am more familiar, where the cost of coal for cooking is somewhere between four to seven or eight dollars, with a rate higher than five cents it is impossible to develop any kind of a cooking load that is worth while. You can do something at that, but it is not a satisfactory rate, and the competitive value of the gas and other fuel in that territory makes it an impossible economic situation. There isn't any peculiar kind of education by which you can make people use current for something that has no comparative economic value. You can't sell light today for twenty-five cents a kilowatt-hour to anybody. None of us would contend that you could, and the same situation is true of cooking.

Speaking about the Commission question again—because I think it is vital to all of us—when we first put in a special cooking rate on a separate meter, believing it to be perfectly defensible in the total cost, we waited for the day when we were going to have a lot of complaints from other customers, especially power customers. The Central Illinois Public Service Company serves one hundred and fifty communities in Illinois. Up to date we have had just one complaint in four years instead of having a flood of these complaints. That complaint was from a power customer who went to the Commission and complained about the great discrimination between those two rates. We went in and made a very complete showing of the reasons why we do it, the field that was to be served, the competitive value of the service, the fact we were loading up a residence distribution system that had no load on it about three-fourths of the day, and never would have any greater load on it unless we served it this way, and we finally got a decision that seemed to us to be a complete justification of our cooking rate of three to four cents as against power rates averaging five to eight cents and lighting rates averaging ten to fifteen cents. In Illinois about four hundred and fifty communities out of six hundred and seventy-five communities now have low special cooking rates. Where we anticipated troubles from rate comparisons, they proved to be mostly imaginary.

In conclusion I wish to say that I do not think the day is far distant, and it ought not to be distant, when every electric company, at least in a territory where there is no gas service, ought to be serving some electric cooking load, serving it in a way that makes it one of its regular fields of business. The field for that load has grown, I don't think there is any question about it, and unless we tackle the fields we have left, we are not fully serving the community. (Applause.)

Chairman Learned: The report is now open for general discussion, gentlemen, and we will limit the discussion to three minutes.

J. H. Y. Kidd, Newburgh, N. Y.: I have listened with a great deal of interest to the discussion of the report on electric ranges.

Our company, in addition to serving three or four cities, covers a large suburban territory in which we believe are many prospects for electric ranges.

The point I would like to hear discussed is just what effect this range business has on the distributing lines where the present load is largely a lighting load. Have the member companies found from actual experience that the load comes on during the peak hours?

Operating departments sometimes criticise the Commercial Department for loading up their suburban lines, thus necessitating large expenditures for new lines and equipment, etc. I would like to hear some discussion on this subject.

Our rate for this class of business is 3½c. per kw-hr. less a prompt payment discount of 5 per cent.

If we could have a general discussion on the question of effect on lines, I believe my question would be answered.

Chairman Learned: Any further discussion, gentlemen?

W. J. Clark, Mt. Vernon, N. Y.: I would like to ask a question about the Boston installations. I think the gentleman said the company would make an installation costing $150 for the service, and I would like to know whether its costs are so segregated as to allocate the net revenue from the current sold on this service. If I am rightly informed the rate for current sold is ten cents for the first ten kw-hr. per month, and two cents per kw-hr. for the excess of ten kw-hr. per month. I would like to know if there is any net revenue for such sale?

Mr. Greenwood: Evidently I did not make myself understood on the statement of a $150 service cost. I mean to emphasize that our company last year made $150 the maximum expenditure for a range supply service. The cost included the transformer, or if we had to change transformer only, the added cost was included.

On the subject of service costs in general, I would say that in Boston some customers have been added at an expense of less than $50, while for other range customers we may have to spend $350. The cost varies in the different communities and also in accordance with the location of a customer in relation to our present lines of distribution.

If it is in order, Mr. Chairman, perhaps I can answer these gentlemen on the subject of distribution service cost in the suburban districts. Engineering departments of the larger companies look at the service cost as very great at this time, but it seems that we should consider this as the development cost. In a large number of our districts the money that is represented in the present distribution will furnish three times the number of ranges that we have in the districts now. Divided into the actual number of ranges in each district, the cost of service would be in cases pretty heavy, but there may be capacity for three times the number of ranges with comparatively small additional expense. In one district we may be loaded up all we can stand. In certain of our towns we may have a house where there either is no gas, or which gas mains do not reach, and the customer wants some other method of cooking besides coal, and puts up a strong bid for electric range service. The cost of supply may be comparatively high, but the expenditure may be justified on the basis of possibility of additional business. Our low rate covers heating, cooking and refrigeration which may be combined on that service. Our company has felt justified during the developmental stage in placing a liberal amount of money in service supply for electric ranges.

MR. HUGHES: I would like to ask Mr. Clayton the number of ranges he has on his lines and the average installation cost.

MR. CLAYTON: The Central Illinois Public Service Company has fourteen hundred ranges. In 1914 and 1915 the total additional capital expenditures that were put out to connect the first one hundred ranges averaged about $24 per range. With the great increase in the cost of all materials entering into connection, that cost now is between $50 and $60 per range. I am speaking now of the average cost. We have individual cases that cost $150, and we have individual cases that cost $25. That is all according to whether the transformer in the immediate vicinity is now loaded or whether it is located near the range to be served, or what you have to do to serve the range initially. Speaking about the cost of installing a range, when we first started to serve ranges, the engineering department wanted to connect the range like a power customer. They found it had a connected load of about 6 kilowatts, and they wanted to put in a 5 kilowatt transformer for every range.

We believed some of the representations Mr. Hughes made to us about the diversity of this load, and we took a chance on the diversity. For instance, our meter department wanted to put a 50-ampere meter on all ranges having a full load of 55 amperes. We now use a three-wire 15-ampere meter, in about 98 per cent of our ranges. The same is true of transformers; I know of companies that use a 5-kilowatt transformer wherever they serve a range. It is a mistake. There is no necessity for it. We can serve an electric range with a 3-kilowatt transformer, and in addition to that we can load up that transformer on lighting and we don't burn it out. Half the companies don't take advantage of the diversity of the range load, and unless they do they are spending a lot of money that is not necessary for immediate service, and they are not receiving the diversity of which they ought to take advantage. The same is true of every element in it, service, wires, meters, transformers. You have got to find out how far you can go on the least investment necessary. If you are not giving good service you will hear about it. It will be generally a question of low voltage and that will occur usually long before you burn out transformers. (Applause.)

CHAIRMAN LEARNED: Any further discussion, gentlemen?

W. H. ABBOTT, Omaha: Is the question of how to sell ranges going to come up later?

CHAIRMAN LEARNED: Now is the time.

MR. ABBOTT: It seems to me we are nearly all agreed that the electric range will work. The question is, if we are all convinced of that, how can we sell these ranges, that is, how can we sell them without a large selling expense? We have been selling electric ranges for about four years and are thoroughly convinced of their workableness. We have three hundred ranges out already, but we think it has cost us a lot to sell them. We have tried a good many different plans, mostly at the suggestion of the range people, who have assisted us a great deal; in fact without their assistance, I am sure we would not have had anywhere near the results we did have, but we are looking for some new suggestions as to how to sell ranges. We have worked hard for four years—well, three years; last year we didn't work very hard, but the three preceding years we did, and we are still open to suggestions. Our property consists of about eighty towns in an agricultural district. In most of those towns there is no gas, small towns, just the towns in which you would think they need electric ranges, in fact, we know they need them, but how can we convince these people that they do? In other words, how can we make them know that they need electric ranges? That is our great question.

Chairman Learned: Is there any further discussion?

Mr. Hughes: Mr. Osborn has had a good deal of experience in selling ranges and I would like to have him answer this last question.

M. C. Osborn, New Britain, Conn.: With your permission, when I am called upon to lead the discussion on water heating, I may summarize the range question, and I think that will be sufficient.

Chairman Learned: As our time is practically over, I will call on Mr. Killeen to summarize the discussion.

J. F. Killeen, Chicago: Gentlemen, we certainly appreciate your attention. I speak for the chairman now and the secretary who have been working very hard. You have been with us an hour and ten minutes, and you have been very patient, and we also thank the gentlemen who contributed to the discussion. To summarize this would encroach on Mr. Osborn's time and therefore I will not do it.

Mr. Jalonick of Texas should have been here, but he was unable to come and sent the following telegram:

"Dallas, Texas, May 20, 1919.

"J. F. KILLEEN.

"National Electric Light Association,

"Atlantic City, N. J.:

"To my friends and associates of the Electric Range Committee, please extend my sincerest regrets at my inability to be in attendance at the convention. Be sure to secure for me copy of the Proceedings.

"HARTWELL JALONICK."

Mr. Michel was not able to be here and he sent the following telegram:

"Jalonick will not be at convention. I have wired Russell to place you in full charge of Range Session. Please take hold and put it over.

"C. E. MICHEL."

CHAIRMAN LEARNED: The next discussion is "Technical Features of the Electric Range Business." I call upon Mr. Dwight in the absence of Mr. Jalonick.

THEODORE DWIGHT, New York City: There is no need of any discussion on the technical question. Mr. Jalonick did not prepare any papers and no papers have been prepared by the Committee beyond what will be found in the Range Report of which everyone probably has already received a copy.

CHAIRMAN LEARNED: We will now open to general discussion the matter of the technical features of the range business and water heating by electricity.

M. C. OSBORN, New Britain, Conn.: Mr. Chairman and gentlemen: I have been requested to give you some information on the question of heating domestic water. Before we start, however, I have been asked to summarize some of my experiences in the sale of the electric range. I have sold in the last four years about twenty-five hundred electric ranges, real ranges, very few of which went into apartment houses. Quite a number, however, went into homes that were not improved, and could not use a water heater, but of these twenty-five hundred ranges we have 75 per cent of the possibilities also using service of the Washington Power Company in Spokane for the domestic water heating.

One speaker said that the electric range had been battering or bucking around for fifteen years. I was wondering how old George Hughes really is.

Another said that the electric range was the state of mind as to your ability to sell. I believe it is the ability to make an all-electric kitchen by heating the domestic water. Another speaker said it is a question of rates. In Spokane, Washington, the utility, which is privately owned, has a three cent rate for cooking, and Tacoma, with about the same population and a municipal plant, has a rate of one cent per kw-hr., yet the privately owned utility in Spokane has fifty ranges to Tacoma's one. (Applause.)

I want to say a word in defense of washing machines. Someone has mentioned here that the cost of electric washing machine repairs is more than that of the electric range. If you will demonstrate washing machines correctly, and not overload them, you will find that they will give service with just ordinary repairs.

How to sell ranges? I think that in the beginning you will have to do a little pioneer work, which will cost a little money, to get a few ranges in every community—then one range sells another. Our first work in Spokane cost us perhaps $50, including the sale, the cost of trading in the old coal range or gas equipment, the cost of uncrating the electric range, assembling it, burning it out, sending out two men with it and teaching, and seeing that all the elements were heating properly. That has been reduced to less than $30 now that the business has become a growing business. It costs us in capital expenditures, independent of distribution, from $80 to $90 under ordinary or normal conditions, on account of increase in transformer service and meter equipment. The cost of getting a range going and having the consumer understand it is greatly reduced after you have a few in the community. I find that quite a few are installed and before the demonstrator can get there the consumer thoroughly understands the cooking and baking perfectly. The whole trick has been in the use of the kilowatt-hour, and when you have demonstrated that enough to the public by having enough ranges on the line, your demonstration costs are reduced to a minimum.

Having been delegated to give you a talk on the water heating end of this business, I will proceed.

DOMESTIC ELECTRIC WATER HEATING IN CONJUNCTION WITH ELECTRIC RANGE INSTALLATIONS

By M. C. Osborn

In discussing the subject of domestic water heating it will be necessary to take up certain features of the electric range, such as performance, rates, manner of installation, etc., so that my remarks might be called a combined talk on domestic water heating and the electric range, the latter acting as an auxiliary when the kitchen is not made an "all-electric kitchen" by the introduction of appliances to do the domestic water heating.

The Gas Man's Experience.

About thirty years ago the Brush electric arc light came into use for commercial lighting, followed by the incandescent lamp for both commercial and residential lighting.

About the same time the Welsbach incandescent gas mantle appeared on the market, using gas as a fuel to heat the mantle to an incandescence. This gave four times the light and cut the consumption per burner fully 50 per cent. The standard of the Gas Man's light was 16 candles with a consumption of five cubic feet of gas per hour, against the incandescent electric lamp giving 16 candles of light with approximately 60-watts of demand; this was where the 16 candle-power electric lamp received its name.

About this time the Gas Man invented the phrase "Cook with Gas" and rushed frantically about extending mains, running services, fuel runs, and installing appliances free of charge. He reduced his rate for gas used as fuel and installed another meter, charging the old rate for the gas used for illumination. These cooking appliances in most part consisted of 2-hole hot plates, and were placed as an auxiliary to the coal or wood range, no attempt being made to heat the domestic water. It was soon found that this policy must be changed or we were ruined. To accomplish this the gas water heater was placed on the market, all-gas kitchens appeared, one meter was removed and all gas consumed for whatever purpose was charged at fuel prices. All-gas kitchens only were installed thereafter, as when water was heated with the coal or wood range, the range was used for cooking also during that period, this reducing gas consumption.

This is a true story of what the Gas Man went through during the pioneer period of introducing gas for cooking. Shall we profit by it and install "all-electric kitchens" which make a profitable return possible to the central station and which are installed without additional capital expenditure, the items of expense being the generating costs, or shall we adopt the unprofitable way and pass through the pioneer period as did the Gas Man?

This, then, leads up to the vital question of electrically heating the domestic water in the home.

At the 1915 Convention of this Association in San Francisco a meeting was held of the commercial men belonging to the Northwest Electric Light and Power Association, which is affiliated with the N.E.L.A. At that meeting a committee was appointed to report on the electric range and electric kitchens at the Portland, Oregon, Convention of the Northwest Association in September of that year. The report was ably presented under the leadership of W. R. Putnam, then of Salt Lake City, Utah, and now vice-president and general manager of the Idaho Power Co., at Boise, Idaho. It was very well received and was the best report presented up to that time on the subject of cooking electrically.

As some central stations answering questionnaires as to their activities reported business secured in domestic water heating, a committee on water heating was appointed to report at the Seattle, Wash., convention in 1916. This report showed a marked increase in water heating and was recommended by the committee after much research work.

At the 1917 convention held in Spokane, Wash., it was reported that more "all-electric kitchens" had been installed during that year than in former years. This was augmented by the fact that it was found that ranges installed without water heaters proved to be auxiliary to coal and gas ranges, did not consume enough kilowatt-hours, and consequently did not return enough revenue to warrant the capital expenditure necessary to connect them up. The 1917 report stated that some companies had sold more water heaters than ranges and for the year 1918 one company reports 840 water heaters and 661 ranges sold during the same period. This same company reports to May 13, 1919, 274 ranges and 179 water heaters sold.

In the report of the Water Heater Committee, Mr. W. R. Putnam, chairman, by way of introduction, says:

"The matter of water heating is one of the first problems to confront the station which has decided to encourage the introduction of electric cooking, as to make electric cooking a real success it is necessary to furnish an adequate supply of hot water. This, of course, should be done electrically for various reasons. First, the consumer is generally induced to install the electric range for the reason of its greater convenience, comfort and cleanliness; therefore, unless she also installs an electric water heater she has accomplished only one-half of what she intended, in that she is still compelled to build fires with their attendant dirt, discomfort and inconvenience. Second, unless a water heater is installed the central station is deriving only one-half of the revenue it should from the range installation. It should be the policy of every station to encourage the use of electricity in the home to the maximum, that is to do everything possible electrically so as to secure all of the revenue possible from each residence. Therefore, it would seem unwise to advise a consumer to install an electric range and to use some other method of heating water. This is especially true since electric water heating is so simple and satisfactory. Absolutely perfect hot water service can be supplied electrically with no attention on the part of the consumer, and the load is more desirable than that of the range for the reason that regulation makes little difference in the operation, and, if necessary, the demand can be made to come on at any desired time. Further, since the readiness-to-serve cost for the range alone is the same as for the range and water heater combined, it is simply a matter of approximately doubling the revenue with no additional expense other than the cost of generating the required energy."

Mr. Putnam continuing makes the following recommendations:

"It is believed the water-heating problem is of such magnitude as to require serious study by each station, and each installation should be given more or less attention, for the reason that the requirements vary so greatly, owing to the differing climatic conditions, cost of supplying current, and costs of other fuel. It is difficult if not impossible to make up a set of instructions that can be followed and expected to produce perfect results in every case.

"It is believed, however, that in general the following outline will cover a large proportion of the requirements. It is no doubt a fact that a thoroughly reliable thermally controlled circulation type heater is the most satisfactory for ordinary residence purposes, providing the rate for current will allow of its use, for the following reasons:

"First—The majority of residences demand hot water at a number of faucets located throughout the house.

"Second—A large percentage are already equipped with 30 or 40-gallon range boilers which cannot be changed.

"Third—It is desirable to have at all times a sufficient supply of hot water to meet all demands.

"Fourth—If the heater is of the correct capacity to operate a large portion of the time, the load factor is good and it is consequently entitled to a low rate for energy; this is especially true if the heater be connected on the opposite side of a double throw switch with the range."

On general remarks, Mr. Putnam adds the following:

"These recommendations have been based on supplying domestic hot water service, for the reason that the subject is one of vital importance in connection with the introduction of the electric range, but the information contained herein will also be of value in the development of electric water heating in barber shops, hotels, restaurants, apartment houses, dairies, industrial establishments, etc. When considering electric water heating propositions, it is well not to become discouraged by comparing the B.t.u of a kw-hr. with those contained in coal, wood and oil, for the reason that electric heat can be utilized so much more efficiently, and almost every one is willing to pay more for the convenience, cleanliness and safety."

And, in conclusion, makes the following comment:

"In concluding the Committee would like to state the facts as it sees them:

"First—That water heating is fully equal in importance to cooking.

"Second—That every station give it consideration, as the income can be made to equal or exceed that from cooking at practically no extra overhead or sales expense.

"Third—That it is a more desirable load than cooking.

"Fourth—That it will increase the popularity of electric cooking by supplying an ideal hot water service.

"Fifth—That the success of the service depends upon four things, as follows:

"1. The rate.

"2. The selection of the heater.

"3. The manner of installing.

"4. The thorough insulation of the boiler."

In the territory covered by the Northwest Association we find principally hydro-electric plants so the value of the kilowatt-hour is not as great as in steam generating plants, as from 40 to 60 per cent of the available kilowatt-hours are unconsumed and could be marketed at a very small additional operating cost. Flat rates were made for this service with the water heater feed cut in ahead of the range meter with a double throw 2-pole switch to cut out oven and broiler when the water heater is in operation. The water heater is on one side of the three-wire circuit, and the surface or boiling burners on the other side which is always alive. This promotes kilowatt-hour consumption. It will thus be seen that the water heater demand does not show on the range peak at any time and does not have to be provided for in increased distribution, transformer, meter and other capital expenditures.

At this point let us bring out just what a water heater in connection with range installation means in revenue by assuming a combined light and cooking rate and a flat rate for water heating.

Assumed combined lighting and cooking rate.

1st 20 kw-hr. per month	10c. per kw-hr.
Excess over " " " " "	3c. per kw. hr.
Domestic water heating..................	$36.00 per kw. year

Consumption as shown in practice without water heater.

For lighting 16 kw-hr. per month..............192 per annum
For cooking 70 kw-hr. per month..............840 per annum

Total....86 kw.hr. per month...........1032 per annum

Example No. 1 showing revenue for 12 months:

240 kw-hr. @ 10c = $24.00 light
792 kw-hr. @ 3c = 23.76 cooking

Total $47.76 per annum
equals $.046 kw-hr. lighting and cooking
equals $47.76 per kw. year revenue (not enough).

Consumption and revenue as shown in practice for light, range and water heater:

For lighting 16 kw-hr. per month............ 192 per annum
For cooking 120 kw-hr. per month............1440 per annum

Total.......136 1632

Example No. 2 showing revenue for 12 months:

240 kw-hr. @ 10c = $24.00 lighting
1392 kw-hr. @ 3c = 41.76 cooking
750 w. water heater = 30.00 water heating

Total $95.76

The kilowatt-hour consumption by the range shown in the two examples is the average consumption shown in real practice. The increase in kilowatt-hours in Example 2 is occasioned by the fact that all cooking is on the electric range while it is only partially so where coal or gas remains to do the water heating. People will use the waste heat for cooking when heating water with the coal or gas range.

If the water heater has an 80 per cent load factor or consumes 4320 kw-hr. per annum, 192 kw-hr. for light and 1440 kw-hr. for cooking, a total of 5952 kw-hr. per annum gives a rate of 1.6c. per kw-hr.—$95.20 per kw. year revenue, and shows a possible remunerative return for hydro-electric stations.

It has been shown in practice that the average demand on the station buss bar per consumer with light, 500 w. connected, range 6000 w. connected, water heater 750 w. connected, or a total of 7.25 kw., will be 1 kw. and shows a diversity of 7 to 1. In the first example the station receives $47.76 per kw. year as against the second example of $97.20 per kw. year. The above examples are very conservative in comparison with some in the Range Committee Reports of the Northwest Electric Light and Power Association for the years 1915, 1916 and 1917.

Where all-electric kitchens are installed the following revenues per capita may be expected independent of the water heating:

3 persons or less..............	$45.00 per annum
Each additional person........	12.00 per annum
Maid counts as 2 persons....	24.00 per annum

and apply to communities that are fairly well saturated as to electric light consumers.

Those central stations which do not cover their whole territory but do selective residential lighting receive greater kw-hr. consumption than the example shown above and will receive a corresponding increase in kw-hr. for cooking.

The following examples are offered as a suggestion, assuming a 3-step block rate to take care of light, range and water heater load,

1st 30 kw-hr. per month.............	10c kw-hr.
Next 120 kw-hr. per month.............	3c kw-hr.
All over 150 kw-hr. per month.............	1½c kw-hr.

With a diversity of 7 to 1 and using 30 gallons of hot water per day, as shown in previous examples showing revenues, the above rate would give a buss bar revenue of $144 per annum for combined lighting, cooking and water heating.

Some reports place the diversity of the electric range as high as 10 to 1 but placing it at my figure, as shown in the above examples, at the safety factor of 7 to 1, it is safe to say that thermostatic control of water heaters will have as good, if not better, diversity factor than the range.

Why should not the steam generating station look upon water heating in the home from the standpoint of a power consumer with thermostatic control for the conservation of kilowatt-hours?

One kilowatt operating continuously will heat 75 gallons of water per day and consume 720 kw-hr. per month, but to make safe and take care of all reduced intake temperatures we will assume 60 gallons per 24 hours to 1 kw. of demand, and assume the average consumer as using 30 gallons of hot water at 175 degrees fahr. per day or 900 gallons per month, and consuming 360 kw-hr. during that period, which at 1½ cts. per kw-hr. equals a revenue of $5.40 per month or $64.80 per annum, which I believe would prove to be a safe flat rate with thermostatic control.

Note.—The above conclusions are made with the assumption that in all cases the tank will be thoroughly insulated for the conservation of heat.

The following statement of S. M. Kennedy, general agent of the Southern California Edison Company, appears in the discussion relating to water heaters in the 1917 proceedings of the Northwest Electric Light and Power Association: (The Southern California Edison Company generates part hydro-electric and part steam).

"At the beginning of this year we had not one water heater on our lines—that is except one small individual case. We had hesitated about putting in a rate for water heating such as you had up here in the Northwest and in some other places on a flat rate basis, as we are not in position to sell our energy upon a flat rate basis. So, we hesitated about selling ranges for fourteen months before we decided to sell water heaters, and then we established this combination schedule which gives, for the first block, which is for lighting, twenty or thirty kilowatt-hours; for the second block which is for cooking, one hundred kilowatt-hours, then we have a third block or all in excess of the second block at two cents per kilowatt-hour. That energy is all measured on one meter and comes off of one service. We have found that a water heater when properly installed is a satisfactory apparatus at a rate of two cents per kilowatt-hour for the average consumer who takes from us an electrical range. We find further that when the consumer has not gas for heating, the electric water heater at two cents a kilowatt-hour is less expensive to that consumer than any other fuel which he may be using. We cannot say that water heated by electricity is better than by gas because it is not. We cannot say that it can be done cheaper because it can't; but we can say that where we come in contact with other fuels, coal or wood or anything else, the water can be heated and kept more satisfactorily heated by means of an electric water heater than by any other method outside of gas. We don't try to sell water heaters where we are competing with gas, and particularly where we have natural gas at a very low cost per thousand cubic feet. But we are selling hundreds of water heaters. In fact we cannot get them fast enough—or could not when I left home last week—and we are going to sell a great many more. We have learned, therefore, that the water heater at a two cent rate with us is a particularly satisfactory apparatus and we expect to add thousands to our load.

"We have also learned that the water heater is just as good and perhaps better for us than is the range. It doesn't come on when the range is on, except in a few instances, and it uses more current on the average and consequently the yield per month is greater. The investment for supplying the water heater with service is no more than the range and we can well afford to take a two-cent rate for water heating as long as the full 100 kilowatt-hours for cooking is taken care of on a basis of three and a half cents. That is the second thing that we have learned this year, and we are very proud of it. We think that we have solved that question and we think we have solved it in a satisfactory manner and we do not cast any longing eyes up here at your water heater load on a flat rate when we can make the installations as rapidly as we can make them now upon the basis of two cents per kilowatt-hour."

The following is the rate for one company in the West for combined cooking and water heating load:

First 30 kw-hr. per month per active kw. connected......4c.
Next 90 kw-hr. per month per active kw. connected......2c.
Balance ....1½c.

The active load is determined by counting the first 2 kw. as 100 per cent, balance 50 per cent.

It has been found that the hydro-electric plants of the West did not start with all the traffic would bear for flat rate water heating—that is $36.00 per kw-year in some cases, but as the water heater and the oven alternate in use there must be a diversity which, if like the range is 7 to 1, would show a buss bar revenue of $252 per kw-year.

Think it over and compare it with your other power business, which has the possibilities of development such as the water heater has, and compare it with such power business as ice making, street lighting, etc., which have no diversity factor.

Much has been said concerning commissions and public opinion regarding such a low rate in the home. I cannot see where such arguments count, as the same rate could be applied to any character of business which had as good a load and diversity factor and was off all peaks.

Then there is a friendly factor in connection with this water heating business that is generated in the home and that is reflected to our commercial business. One company refers to water heater users as its domestic water heater friends.

A study of the following abstracts from the report of B. L. Steele, Professor of Physics, State College of Washington, will prove very instructive. A copy of this was sent in the form of a circular letter to 26,000 residential consumers in one Western City and produced results.

"The results of comparative tests of coal, kerosene and electricity for cooking herein presented have been accumulated in connection with a special course in Physics which the writer has given for several years at the State College of Washington for the students in the department of Home Economics.

"The efficiency tests of gas, kerosene, gasoline and alcohol burners and of electric heating appliances have been made each year by the girls in this course and have been carefully repeated and checked by the writer and laboratory assistants. The tests on coal ranges were made on the two Monarch ranges in the Home Economics department, on the ranges in the homes of students living in Pullman, and at sorority houses. The cooking cost data were obtained at the Home Economics Practice Cottage.

"Table I gives the value in calories, or the heat equivalent of 5 cents worth of each of the various "fuels" at the prices prevailing in Pullman, Washington, in December, 1916.

Table No. I

Fuel	*Calories*
Coal (Rock Springs) @ $10.00 per ton	32,250,000
Kerosene @ 20 cents per gallon	8,550,000
Gasoline @ 25 cents per gallon	6,130,000
Alcohol @ 75 cents per gallon	1,340,000
Electricity @ 3.85c. per kilowatt-hour	1,116,000

Table No. II gives the average efficiencies of the various kinds of cooking equipments. In determining the maximum efficiency of the coal range, the entire top was covered with large vessels of water, *e.g.*, wash boilers or five gallon gasoline cans, the oven being similarly used. The fire was not lighted until the initial water temperature had been taken, and usually two pounds of kindling and ten pounds of coal were completely burned before the record of the final maximum temperature was made. It was estimated that as the coal range is used for cooking in the average home, not more than one-fourth of the available space is utilized at any one time and that the cooking operations are being carried on less than one-half of the time during which the coal is burning. If this estimate is correct, the average "cooking" efficiency of the coal range does not exceed 2 per cent.

Table No. II

Kind of cooking Equipment	*Efficiency*
Coal Range (entire space utilized)	18%
Coal Range, estimated home cooking (about)	2%
Flame Contact Burners (kerosene, etc.)	28%
Electric Heaters, surface	45 to 65%
Electric Heaters, enclosed	70%
Electric Heaters, immersion	90%

"The efficiencies of the flame contact appliances, which include standard kerosene and gasoline blue flame burners, alcohol lamp for chafing dishes, and gas burners, varied from approximately 20 to 35 per cent. The calorific values of the various fuels were obtained either from dealers or standard handbooks, or were determined in the laboratory.

"Nearly every kind of electric heating appliance was used and under widely varying conditions. Room temperatures, existence of air currents from open windows, material and condition of surface of utensil used, wattage of heater, relative size of heater and utensil, and quantity of water heated, were all found to affect the efficiencies very considerably, particularly those of the surface and immersion types. In these experiments the thermometers, standard ammeters and voltmeters and the balances used were such, and the care exercised was such that a variation in efficiency greater than 1 per cent was not to be attributed to accidental error.

"The average working efficiency of the electric range, as used in the home, depends on so many factors that to make an accurate estimate is rather difficult. It is believed, however, that in the hands of those who have had a bit of experience in making the proper combination of surface, enclosed and immersion heaters, the efficiency should be above 60 per cent.

"Table IV gives the heat available for cooking in 5 cents' worth of each of the 'fuels,' proper allowance having been made for the working efficiencies of the various cooking appliances.

Table No. IV

"Fuel"	*Calories*
Coal (range at 2% efficiency)	623,000
Kerosene (range at 28% efficiency)	2,400,000
Gasoline (range at 28% efficiency)	1,716,000
Electricity (range at 60% efficiency)	669,600
Alcohol at 28% efficiency	375,200

"For the purpose of affording laboratory work in the course in Household Administration, the department of Home Economics at the State College of Washington maintains a 'practice cottage.' The seniors each year are divided into groups of four students each and each group, together with a chaperon, spends four weeks in the cottage. This arrangement permits each student to have the management of the cottage for one week. Before entering upon the month's work at the practice cottage, each of the four girls has made out a week's menu and has determined the necessary quantity of each article of food entering into each menu according to the needs of the members of the group. The girls are 'weighed in' at the beginning and 'weighed out' at the end of the month and in most cases are found to have fared better than on their regular boarding house or home cooking.

"During this year, through the generosity of the Washington Water Power Company, the practice cottage has been equipped with a Westinghouse electric range in addition to the coal range. This arrangement has made it possible to obtain data on the cost of cooking with coal and electricity for a family of five. During the winter when the furnace was in use the water front of the coal range was disconnected, the hot water for domestic use being furnished entirely by the coil in the furnace. During the late spring the water front was connected up and all hot water needed was heated by the range in connection with the cooking.

"In considering the results which follow, the fact that the work was carried on by students who were busy with other regular college work must not be lost sight of, and it should be mentioned also that each of the 19 girls who lived in the practice cottage had had considerable experience cooking on the coal range and that none of them had had experience with the electric range. To help us out of this difficulty, The Washington Water Power Company very generously offered the services of its expert, Miss Addison, who gave demonstrations to the groups on several occasions. Each student, whether cooking on the coal range with or without the water front, or on the electric range, was instructed to practice economy as much as possible.

Table No. IX

Equipment	Average Cost *Per week*	*Per meal*
Coal range, water front connected	119.6c	5.70c
Coal range, water front disconnected	77.4c	3.67c
Electric range	78.5c	3.72c

"The writer realizes fully that the amount of data presented is far too small to justify the making of any very sweeping inferences but at the close of the coming year he hopes to have very complete results, and at present feels that he is warranted in urging that our coal supply be conserved by not using it and that our water powers be conserved by using them, for every pound of unburned coal is saved but every kilowatt-hour of water power unused is wasted."

Types of Water Heaters

Three types of heaters are employed: the inside circulation (immersion), outside circulation type and the clamp-on or plastic heaters. The inside circulation type is inserted inside at either the top or side of the tank—requires plumbing besides the electric connection and is considered the most efficient of any unless there be elements in the water that precipitate with heat such as lime or silica which collects on the immersed element and soon renders it very inefficient. The outside circulation heater is a part of the tank itself, the element within heating and circulating the water at the top of tank, which is an advantage over other types when small quantities of hot water are desired quickly—requires considerable plumbing and is reported as 90 per cent efficient when the water is pure. The same remarks apply to this heater as the immersion heater if impurities appear. The clamp-on type is placed at the bottom and outside of the tank—requires no plumbing, simply electric connection, is reported to be 85 per cent efficient and is the most desirable heater as the solid matter precipitates in other types when the water comes to the boiling point (212 degrees fahr.), while with the clamp-on type under ordinary working conditions the temperature of the water seldom reaches more than 175 degrees fahr., at which point solid matter is not precipitated as the heater is at the intake of the tank.

Under ordinary conditions—

600 watts for three persons or less
750 watts for four or five persons, and
1000 watts for six to eight persons

will be ample capacity, making an allowance of 500 watts in each case where the circulating system of house piping is installed.

Requirements for Service

Some stations install 50 per cent of connected load in transformers, others as low as 25 per cent. When ranges are reported slow, this would indicate a drop in voltage and the consequent transformer overload, assuming at all times that the distribution feeders are ample. A 15-ampere meter is sufficient for 4-hole standard makes of ranges. Service wire from pole should be 3 wire No. 6 B. & S. gauge copper wire for 100 feet or less—over 100 feet larger in size according to distance; the feed from meter to range to be 3 wire No. 8 B. & S. gauge copper wire for 50 feet or less in length, over 50 feet correspondingly larger.

Good regulation is very important that the range may give the same service at all times.

The range should be burned out at the shop rather than in the home—other imperfections sometimes appear during the burn-out and require attention in the shop.

Sale of Range

No attempt will be made to give a discourse on salesmanship except that a few primary recommendations are given that have proved to be good in practice.

1st. Get the cooperation of the whole central station force for the sake of the service—in other words, sell to them first.

2nd. If range and water heater salesmen are employed, sell to them before sending them before the public.

3rd. Make installations at "a price" in each neighborhood or in each block. These installations, if properly installed, will prove to be your best salesmen.

4th. Office demonstrations are necessary for the purpose of selling during the pioneer stages. Home demonstrations become unnecessary after a number of users are on the line. It has been found that new users are timid in using kilowatt-hours, but in a short time this becomes negligible.

5th. Newspaper advertising has been found to be most productive in securing results and is less expensive in the end. Other forms are used, however, in the shape of personal letters, distribution of manufacturer's literature and follow-up advertising.

6th. Time payments with a price for old equipment have proven effective.

7th. Special campaigns controlling the price, such as sales in the winter to keep the operating department employed the year round.

No minimum for this service is necessary as it has been found in the sale of some 2500 ranges and 1700 water heaters that this class of consumer is the most satisfactory of any class.

In conclusion I wish to state that much valuable data on this subject are omitted from this paper which are given more fully in the Proceedings of the Tenth Annual Convention of the Northwest Electric Light and Power Association, held in 1917. These Proceedings have been much sought and at this date are hard to get. Should anyone desire further information on this subject the writer will be glad to furnish it.

Mr. Killeen: Mr. Chairman, I move that we extend a vote of thanks to Mr. Osborn.

(Motion seconded, put before the house and unanimously carried.)

Chairman Learned: This is a pretty important subject and it is really too bad that we could not have given more time to it. I would be very glad to see Mr. Osborn's paper in print, and, if there is any discussion, if it will be sent in to our secretary, it will be included in the minutes. I think that especially in view of the fact that this afternoon there are six parallel sessions, the Range Committee is to be congratulated that there are over one hundred and fifty in attendance at this meeting; the interest that you have shown is especially appreciated.

Before we adjourn there is one matter than I want to call to your attention particularly, and that is the Fifth Commercial Session which will be held tomorrow afternoon. In my opinion some of the most important matters presented at the entire convention will come up at that time. The convention ordinarily would be over after the election of the officers and members of the Executive Committee of the National body tomorrow morning. However, on account of the large program of the Commercial Section, it has been necessary to carry through. There is one matter that everybody, I believe, is interested in, and that is the report of the Merchandising Committee, and in addition to that there is the demonstration to be given by Mr.

William A. Durgin of Chicago, which it will be well worth your while to see. Mr. Durgin has prepared a demonstration at considerable expense not only of dollars, but of his own time, and I think that attendance at that meeting will amply repay you.

MR. KILLEEN: Mr. Chairman, I move you we adjourn.

(Adjourned.)

POWER SALES BUREAU DINNER

Hotel Traymore

May 21, 1919, 6:30 P.M.

CHAIRMAN: GEORGE H. JONES.

THE CHAIRMAN: The original convention plans of the Power Sales Bureau called for two afternoon sessions and a large get-together dinner to be devoted mostly to sociability, and our Dinner Committee under its chairman, Mr. John W. Meyer, prepared elaborate plans on that basis. The plans, however, had to be modified when we were advised that we would have to content ourselves with one business session. As it was impossible to cover our work in that limited time we decided to discuss two papers at our dinner meeting tonight.

One of the topics chosen has come into prominence during the war period. It is a subject that we have often considered as part of the skimmed milk of our business. I refer to the subject of "electric welding."

No doubt all of us have met with difficulty in serving this class of customer because of the intermittent character of the load with consequent difficulty in metering, etc. We are glad to learn that there is a possibility of this branch of industry becoming developed so that it will give us a good load. We have with us tonight a man who can tell us something of the characteristics of electric welding processes which I believe will be of assistance to us in the handling of this business. I take great pleasure in introducing Mr. F. M. Farmer, of the Electrical Testing Laboratories of New York, who has for some time been working with Dr. Adams on this matter.

MR. FARMER: Mr. Chairman and gentlemen, I think perhaps a little apology is due you as it has been inferred that I am something of an expert on electric welding. As a matter of fact I know very little about it. My only contact with the subject has been as a member of the Welding Committee of the Emergency Fleet Corporation of which Prof. C. A. Adams was chairman. I understand Prof. Adams was invited to be here, but he is in Europe, and he suggested to your chairman that I discuss this subject here tonight. The time is very short, and I, therefore, will omit considerable material I had in mind, particularly the exhibition of some lantern slides, which Prof. Adams has been using in his lectures on this subject. My talk will be very informal and largely a discussion of the fundamental principles of welding and some of the phases of the subject which will be of particular interest to you men who are connected with the central station companies, particularly the power sales end of central station activities.

As probably most of you know, electric welding is divided into three principal groups or types—resistance welding, percussion welding and arc welding. Resistance welding consists simply in butting together the two pieces to be welded, and passing a low voltage, heavy alternating current across the joint. The resistance of the joint causes the production of the heat which makes the weld. This is the principle of the Thomson process as devised by Prof. Elihu Thomson, a process which has been highly developed and is used extensively. One form of this process is so-called spot welding where the pieces instead of being butted together are overlapped, two copper electrodes are brought down under pressure on the opposite two sides, current is passed through the electrodes and the plates, and sufficient heat is developed at the spot contact between the plates under the electrodes to cause fusion of the metal. The result is in effect an electrically riveted joint.

From the central station point of view a load of this character may be objectionable. It is an alternating current load of low power factor where the current is on and off for very short intervals of time, sometimes only for a fraction of a second. The current used in some of these welding processes runs very high—I heard of one the other day where the current was of the order of 800,000 amperes. The voltage was of course very low, probably only a small fraction of a volt.

Percussion welding is relatively new. The process was devised by Mr. L. W. Chubb, of the Westinghouse Electric and Manufacturing Company. The two pieces to be welded are bridged—that is, the gap is bridged with an electrical condenser, a very large one, which has been charged. The two specimens are allowed to come together suddenly and when they make contact a weld is produced instantaneously by the discharge current from the condenser. The principal advantage of this process is that practically any two metals can be welded together. Also there is no appreciable effect on the physical characteristics of the metals adjacent to the weld, which is an important feature. The process is particularly applicable in the jewelry trade and in certain special work where it is necessary to weld together fine wires of different metals. It is to be noted that this process is not important from the central station point of view because the energy consumption is relatively very small.

The electric arc process is coming into very extensive use and I assume that it will interest you most. There are two forms of electric arc welding, one using a carbon electrode and the other a metal electrode. In the carbon arc process the arc is struck between the metal and a carbon rod—that is between the carbon rod and the joint between the two pieces of metal to be welded.

In one method of applying this process, the two pieces of metal are upset at the ends, so they are a little thicker, and the metal is melted down to make the joint. The other method is to have the edges beveled, and then the gap thus formed is filled in by melting a rod of iron or steel in the arc. The arc simply provides a source of heat and the metal rod is melted into the junction between the plates.

The metal arc process is similar except that this iron filling wire becomes the electrode itself. Thus the operator has only one thing to handle and simply carries this wire along the joint between the two pieces of metal and fills it in.

With the metallic arc, overhead welding can be done—a man can join two pieces of steel on a ceiling. The metal passes up from the electrode to the joint and a good operator can make a perfectly good weld. That peculiar feature of the metallic arc is one of the reasons which has made it difficult for scientists to explain the theory of the metallic arc. One theory is that the metal flows as a vapor and is condensed; another is that the oxygen of the surrounding air combines with the carbon in the hot end of the electrode forming CO_2 at the melting tip and that this gas explodes and blows off particles of metal from the end of the electrode on to the work.

Electric arc welding, both the carbon arc and the metal arc processes, is likely to come into extensive use because it is so flexible. The Thomson process is applied with machines and is essentially a factory process where similar parts are brought continuously to the welding machines in the manner of regular factory production, although considerable success has been had in the development of portable spot welders which could be taken to the job where suitable crane facilities are available. With the electric arc process, the arc can be taken to the work wherever it may be. That means it is particularly applicable to making joints between metal plates anywhere, in any kind of a structure. It was that feature which made it so interesting to the Emergency Fleet Corporation because it looked as though it would be a source of great economy of time in the Fleet Corporation's work. This resulted in the appointment of a committee to see if the process could not be used in the construction of ships to supplant riveting and speed up construction, because it was obvious that joints could be made very much quicker by the electric arc process than by riveting.

However, before the ship classification authorities such as Lloyd's Registry of Shipping could permit the use of the electric arc welding on the structural parts of ships, it would be necessary to convince them that such a welded joint is safe and comparable in trustworthiness with the riveted joint.

The ship registration authorities are very conservative and they "have to be shown." One of the principal jobs of the Research Sub-Committee of the Welding Committee of the Emergency Fleet Corporation was to do that *showing*. It did not get that accomplished before the armistice was signed, and the committee was disbanded on the first of January last, without having accomplished that feature of its work. However, Lloyd's is permitting electric welding on many minor parts of ships. Some of the lantern slides I had intended to exhibit would have shown some of these applications.

The Committee had partly constructed a 40-foot section of a 9,000-ton ship which was expected to demonstrate the applicability of electric welding to structural joints in ships. Some seams were to be welded with the electric arc process and some with the spot method. Destruction tests were then to be made on this full size section. Just before the armistice was signed the Emergency Fleet Corporation had practically given authority for the construction of a 9,000-ton ship to be entirely electrically welded, provided the results on this 40-foot section of a 9,000-ton ship justified such a step. If the war had gone on, it is probable that an electrically welded ship would now be under way, because it was confidently believed by the Committee that the test section would prove satisfactory.

The question of the relative merits of the various types of welding apparatus now on the market is one I could hardly discuss. It is a matter of great controversy in the electric welding field. Most of the questions involve proprietary methods, for in many cases when you speak of a given method you speak of a certain man's process. However, there are some questions of a fundamental character, such as direct current welding versus alternating current welding, the carbon-arc method versus the metal arc method and covered versus bare electrodes in the metal arc method.

The metal arc process is applied with either bare or covered wire. The latter form of electrode was devised to overcome one of the deficiencies which we have in the physical characteristics in a metal-arc weld, namely that the deposited metal between the two bevelled edges which unites the two pieces is practically cast steel and therefore has many of the characteristics of cast steel, one of the important ones of which is its lack of elasticity. The elongation of ship steel, ordinary 0.2 or 0.3 carbon steel, is 25 to 30 per cent; whereas in a metal-arc welded joint made with a bare electrode the elongation is of the order of 5 to 10 per cent. One of the theories for this condition is that the deposited metal has a good deal of oxygen in it which was taken up by the iron particles in going through the arc. Another theory is that it is absorbed nitrogen which forms iron nitride in the deposited metal. It is this lack of elasticity and the fear that the joint would not stand the continuous vibration in a ship that makes Lloyd's conservative about permitting the process for structural joints.

The covered electrode was devised by Stromenger with the idea of overcoming this trouble assumed to be due to oxidation, by covering the wire with a coating of slag-forming materials such as asbestos and sodium silicate. This material is supposed to protect the arc and the hot metal and keep out the oxygen and nitrogen of the air. While this scheme did improve the ductility, it has since been demonstrated that a good operator can get welds of the same order of ductility with bare electrodes.

Now, on the question of direct current versus alternating current welding, you will find proponents of each method. Of course, one man will say the other fellow cannot do it as well as he can. The Welding Committee has ample evidence in its records showing that equally good work can be done with both kinds of current. It is largely a matter of the economics of the situation and the conditions under which the work is to be done. As far as the physical characteristics of the weld are concerned, just as good work can be done with one current as with the other.

The same can be said about the carbon arc and the metal arc. One of the earlier objections to the carbon arc method was that carbon passes through the arc and into the weld, giving a brittle structure. That theory has not been proven, however, and it is now claimed if the work is done right by a competent operator, one can get more ductile welds by this method than with the metal arc.

The investigations of the Committee have demonstrated that in all of these methods by far the most important elements, so far as the quality of the joint is concerned, is the proficiency of the welder and that the progress of the art will depend very largely upon the uniform and high-grade training of the men to do this work. It takes a certain type of temperament, and to get absolutely uniform results (which is necessary in order to get the confidence of the public) we must have a system of carefully selecting and training the welders.

Now, as to the future of the electric welding process. The resistance process, that is, resistance and butt welding methods, will be used more and more extensively in all factory processes. But the kind of welding which is most important to the central station is arc welding because of the greater energy consumption and its very wide range of application. This art is developing by leaps and bounds for application to minor joints, but when insurance bodies permit its use in large or important structures such as ships, railroad cars, pressure tanks of various kinds and especially in the fabrication of the steel frame work of buildings, it is obvious that a very large power load will be available to the central stations.

In the case of building structures alone it is obvious that if the electric welding of joints can be substituted for riveting the central station has a tremendous field open to it, and that day will come and come soon. Thousands of tests have been made to show that the electrically-welded joint has a higher efficiency than the ordinary triple row, riveted joints as used in ship construction. The triple row riveted joint of standard spacing will average 70 per cent of the strength of the plate, while the electrically welded joint will average 90 per cent if the work has been done by competent operators. The one thing lacking is the fear that the joint is too stiff and will not "stand up" under the rapid vibrations to which a ship hull, for example, is subjected. A great deal of work is being undertaken to determine the durability under such conditions, but that difficulty will be overcome eventually and the approval of the regulating authorities will be obtained for all types of structures.

There are perhaps some characteristics of this kind of a load which are not desirable to central station companies, but they will find ways to overcome these features when the business is there. The energy consumed by one operator in using the arc welding process can be figured at something like 75 to 100 kilowatt-hours a day. How many operators there are working in the country at the present time I have no idea, but probably there are several thousand. That will enable you to form an estimate of what the limit might be when you consider that the arc welding process has so far been applied only to small parts, unimportant structures, repair work, and that sort of thing.

I have here some notes on the various problems which were before the Welding Committee of the Emergency Fleet Corporation and which I had intended covering when showing some lantern slides, but in view of the lateness of the hour, I will say nothing more, particularly as there are no facilities for showing the slides. (Applause.)

C. H. STEVENS, New York City: Mr. Farmer has said the strength of the weld, referring to arc welding, depended upon the efficiency of the operator. I should like to ask him if, in work such as ship repair work, it is not a fact which has been borne out by experience that it is easier to make a strong weld with direct current than with alternating current?

MR. FARMER: So far as the information which the Research Committee of the Emergency Fleet Corporation could obtain, there was no positive conclusion indicated. An efficient operator could do as well with alternating current as with direct current.

MR. STEVENS: Did not the Emergency Fleet Corporation in its investigations find that while the alternating current weld is as strong as the direct current weld, it is much easier to train the men to make a good weld with the direct current?

MR. FARMER: That is quite true, direct current arc is easier to handle than the alternating current arc because a larger arc can be used. Consequently alternating current requires a somewhat more careful operator.

MR. STEVENS: That would be particularly true in ship repair work?

MR. FARMER: Yes, in any work. Of course in much repair work, also in much new work where the joints are not in strength members, it makes little difference whether the joint has 50, 75, or 25 per cent of the strength of the metal. It is the vital joints in the strength members of structures which are important, and to pass the regulating bodies the joint must be shown to have the required strength and flexibility and must also be uniform.

MR. STEVENS: I have heard it reported that in the majority of shipyards which put in alternating current, there is a tendency to change over to direct current arc welding. I understand this is borne out by tests and information in the possession of the Research Committee of the Emergency Fleet Corporation.

Mr. Farmer: I have not heard of any such action although, they may have experienced difficulty in getting operators to take hold of alternating current welding as quickly as direct current.

Mr. Stevens: At Hog Island, I understand they put in alternating current welding. Did they continue with the alternating current, or did they change to direct current?

Mr. Farmer: I do not know.

M. S. Seelman, Jr., Brooklyn: It seems a pity we have to rush away from this very interesting talk, through lack of time. This is a subject in which we are all very much interested, and which will assume greater importance as times goes on; and I would like to ask for the experience of some of our members in connection with the installation of spot welding equipment on their lines? We have had quite an influx of these machines during the war period, and they have played hob with the system. We won't allow a single-phase motor over 5 horsepower on our line, but we have been taking these spot welders to run as high as 15 kilowatts, or more; and finally our electrical engineer sat down hard on them and said we would not permit their further installation without adequate protection.

We do not want to interfere with a development of this kind. We do not want to interfere with their establishment on our lines. At the same time that situation must be met, and I wonder how it is being met by others.

H. B. Gear: As far as Chicago is concerned, we have found it necessary to install a separate transformer and to treat welders as a separate installation. However, if it is part of a large installation, we have made the rule that if the welder capacity does not exceed 25 per cent of the total, it may be connected on one phase of the power service. If it is more than 25 per cent it must be treated as a separate installation.

The Chairman: Any further questions?

A. N. Cartwright, Pittsburgh: I would like to ask Mr. Farmer if there has been any development on the lines of the automatic machine, where work is such as shipping.

MR. FARMER: None as far as I know, that has proved satisfactory. Efforts are being made in that direction in order to replace men. That personal element of the operator seems to be difficult to replace in a machine. Any of these methods or machines will make a joint, but whether or not it will come up to the requirements as to strength is another matter. The point that is difficult for the automatic machine to accomplish is to "bite in" in the edges of the plates and get a positive union. A machine just going along a joint and depositing metal will not make a weld. No union between the deposited metal and the plate is obtained. That is just what the efficient operator does do. He swings his electrode back and forth across the joint and gets a good "bite" into the plate, and that result is difficult to accomplish with a machine.

MR. CARTWRIGHT: On the alternating current arc, is it possible to do overhead work with them?

MR. FARMER: I cannot say as a matter of my own knowledge, whether that has been accomplished satisfactorily or not. I do not recall having seen any record of good overhead work done with alternating current. It can be done with the direct current and I think very likely with the alternating current also.

THE CHAIRMAN: Our next topic for discussion is that of electric trucks and tractors and their relations to the central station load. I think few of the central station people realize the importance of developing this class of business which is not only extremely valuable on account of its off-peak character, but forms a very important function in the industrial development of the community on account of the great amount of labor which it saves. Mr. E. J. Bartlett of Cleveland will present this paper and I am sure he will bring out some interesting facts for our consideration. I take pleasure in introducing Mr. Bartlett.

ELECTRIC INDUSTRIAL TRUCKS AND TRACTORS AND THEIR RELATIONS TO THE CENTRAL STATION LOAD

By E J Bartlett

The war period, now ended, together with six months' reconstruction of business, has affected all industries and that of the Electric Industrial Vehicle has been no exception. It is, therefore, perhaps timely to present some information of interest to central stations, relative to these machines and the present position which they occupy in the electric vehicle field.

The war-time demands gave the industry a decided impetus. They brought new types of machines into prominence and new manufacturers into the business, and a wider range of usefulness developed. Owing to these changes, it may be permissible to be rather more elementary in the discussion of some topics than would have been necessary a year or two ago.

In talking to people regarding Electric Industrial Vehicles, I frequently find their ideas a bit hazy as to just what such a vehicle is. This is not surprising in view of the great variety of names by which they are commonly known, and the term "Electric Industrial Vehicle" seems the only one that covers all. As later I will refer to the broad scope of the Industrial Machine, I will describe briefly the common types in use.

The Industrial Tractor is most commonly used to pull a train of loaded trailers. It is, however, frequently used without trailers and does as much pushing as pulling in the handling of heavy objects. It is not a load-carrying machine.

The Three-wheel Tractor is the simplest type and is used for light loads handled in very congested quarters.

The Four-wheel Tractor (Fig. 1) is used for heavier work, and usually steers with all four wheels. One result of the war work demand has been the development of heavier tractors and four-wheel drive tractors. The heaviest machines now weigh 4000 pounds and develop a maximum drawbar pull of approximately 3000 pounds, sufficient to start and move a heavily loaded freight car, as a stunt demonstration, if a good traction surface is provided. Such machines will deliver a drawbar pull of 1000 pounds in average intermittent service.

Manuscript of this paper was received April tenth.

FIG. 1.—HEAVY-DUTY TRACTOR

The Industrial Truck is commonly constructed to carry 4000 pounds. It is occasionally used for light tractor work but is not particularly suited to such service.

The Utility Truck (Fig. 2) is the oldest and simplest type with straight platform, the operator standing on a folding step at one end.

The Baggage Truck is the type seen around depots and is the only one many people know as an Industrial Truck. It is similar to the Utility Truck, with provision for the operator at both ends, and is built in both straight and drop frame styles.

The Low Platform Truck (Fig. 3) is similar to the Utility Truck at the operator's end, with battery carried on top of the frame. Back of the battery the frame is offset to provide easier loading. War-work demand has increased the use of this machine.

The Lift Truck (Fig. 4) is similar to the Low Platform, with the addition of a suitable auxiliary platform movable vertically and arranged to be raised a few inches by means of an auxiliary motor and suitable gearing, drawing its power from the vehicle battery.

Fig. 2.—4,000-Lb. Utility Truck

Special Industrial Vehicles: In addition to these standards, there are numerous specials resulting from a change of wheel base, length, width or platform arrangement, sometimes equipped with all sorts of auxiliary devices such as hoists, winches, cranes, dumping bodies, etc. Some of these types are becoming standard for particular classes of work.

In fact, special Industrial Machines frequently lose their identity as tractors or trucks and become more nearly portable machine tools equipped for specific purposes. The demands of war work brought forth several special types which are proving

FIG. 3.—4,000-LB. LOW PLATFORM TRUCK WITH 1,000-LB. ELECTRIC SWIVEL CRANE

equally as efficient for peace-time work. Two examples of special 4000 pound cranes are shown in Figs. 5 and 6.

Present Manufacturing Capacity

There are now ten or twelve manufacturers of Industrial Vehicles as compared with three building electric passenger vehicles and, I believe, about the same number of companies engaged in the production of electric road trucks.

About one-half are producing the majority of the machines sold. The others are building in a smaller way and are developing to a point where they can enter the field more aggressively. There is a total trained manufacturing capacity, at the present time, for about 5000 machines per year. I venture the opinion that the amount of advertising and sales effort now being devoted to the development of the Industrial compares favorably with that devoted to either the electric passenger car or road truck. This comparatively new machine is now being produced in nearly as large quantities as the two older types of electric vehicles combined.

The battery manufacturers are wide-awake to the volume of battery business opening up along Industrial Vehicle lines, and deserve much credit for the aggressive work they are doing. We look for much aid from them in helping us put the Industrial

FIG. 4.—4,000-LB. LIFT TRUCK WITH PORTABLE PLATFORM AND LOAD

across in a big way. The leading manufacturers of charging equipment are specializing on apparatus suitable for charging Industrial Machines, and they also look to this field as one of their principal sources of business.

Even some manufacturers of hand shop-trucks and trailers are now making portable platforms for elevating trucks and bringing out special ball or roller bearing steel trailers, so necessary to the most economical use of the industrial tractor-trailer train.

It is interesting to note that new factory buildings, terminals, warehouses, and similar buildings are being constructed with a view of utilizing material-handling machinery. And one of the most important classes of such machinery provided for by architects and constructors of buildings of this sort is the Electric Industrial Vehicle. Such new buildings, through competition and general influence, will gradually force in old buildings changes favorable to the use of these machines.

During the war period, practically 100 per cent of the Industrial Vehicles manufactured carried Class A priorities. When the armistice was signed, the Government was getting well into the swing of using Industrials and thus saving man power. It purchased about 1500 machines and deemed them of sufficient importance so that work was progressing, through the Bureau of Standards and the manufacturers of Industrials, tending to standardize the size of batteries, tires, and capacities of the more vital mechanical parts. A portion of this standardization work has carried through and is having its effect on present designs.

Some manufacturers have standardized their designs so completely that many of the important wearing units are inter-

FIG. 5.—4,000-LB. CARRYING CRANE AND DUAL BATTERY EQUIPMENT

changeable for any of their standard vehicles. As examples, a driving wheel and tire, controller, differential and gearing, etc., from stock, fit any type of tractor or truck a purchaser may be operating in a mixed installation of the same manufacturer.

My purpose in outlining the foregoing is to be sure that you appreciate the distance the Industrial Vehicle has already traveled and how it is regarded by its manufacturers and the builders of the necessary auxiliary equipment, also, that you may know that the Government endorsed it as a valuable labor-saving machine, aiding rapid production.

Industrial Vehicle Work

We may say, in a general way, that Electric Industrial Vehicle work is almost any work which a gang of hand-truck men can do. Much of this work trucks or tractors can do better, and they can do some which hand-truck men cannot do. As a matter of fact, I dcn't believe anyone knows very definitely the many kinds of work these machines can ultimately handle to advantage

FIG. 6.—4,000-LB. STACKING CRANE WITH 13-FOOT LIFT

because new applications are being found constantly. At the present time, we can see only the more obvious applications.

Tractors

We all know the Tractor will haul, under favorable conditions, some 50 pounds of trailer load for each pound of drawbar pull. Under good working conditions, then, with three sets of trailers, a tractor-trailer train can handle an extraordinarily large tonnage in a day. In addition to this class of service, it has a wide application for miscellaneous work. It may be used for pushing or even bunting certain classes of merchandise, as well as for pulling. It is a double-ended electric mule with a push, pull or kick at either end. The Tractor, where it can be used to advantage, is the most efficient Industrial machine.

Trucks

The Lift or Elevating Truck comes next from the point of work capacity. Although it is limited to carrying a two-ton load, while the Tractor will haul perhaps five to fifteen tons, it has the advantage over other types of Trucks in being able to work more continuously. Without extra handling, the load, if of suitable class, can be piled on and taken off the little inexpensive wood or metal portable platforms. The low end of the truck is run under this loaded platform, electrically elevated, runs away and drops its load, picks up another, and so on. This means that the machine is in nearly constant operation.

Other truck types, when used strictly as load carriers, usually cannot show such high earnings as the Lift Truck and Tractor because of their idle loading time, yet sometimes they are the only types of truck which can be used to advantage, owing to the nature of the work.

Specials

Then there is the work done by many special types and equipments that are being brought out from time to time. An example is the Stacking Crane shown in Fig. 6. This was developed for stacking heavy shells in magazines but is doing equally as good work in tiering stocks of merchandise in warehouses. Another is the Carrying Crane (Fig. 5) developed for handling shells, metal tanks of mustard gas, and similar heavy munitions from inside freight cars to the Stacking Crane. It is proving to be a valuable machine for the handling of car wheels, steel billets, and similar heavy objects difficult to load on a truck or to handle by man power.

Pace Setters

In addition to tonnage handled or work done, Industrial Vehicles, when properly routed and scheduled, may often be used as "pace setters" for the departments they serve. The results obtained by reason of their dependability and speeding up of production are frequently worth more than the actual work done. These less apparent advantages, which are difficult to express in terms of work or money, except in individual cases, are nevertheless emphasized by the use of these machines over hand labor.

The Volume of Business Involved

As all here are interested, in one way or another, in the maximum number of Industrial Vehicles which the market will absorb, it is pertinent to discuss the actualities and the possibilities of this problem. I have found it extremely difficult to determine the number of Electric Industrials in use at the present time, as different authorities have placed the quantity all the way from 6000 to 15,000. Allowing for the older machines discarded and the considerable number exported, I believe the number in use in this country to be approximately 8000 machines of all types, a large percentage of these having been built during the past two years.

We are now, as I see it, building a few thousand machines per year to fill only a few of the most obvious applications. In the main, our past and present efforts have been expended in making straight, simple applications where no serious education or plant changes were involved.

As a purely visual illustration of the problem of distribution, consider the diagram Fig. 7.

If the total area of the circle is taken to represent the total ultimate scope of the Electric Industrial, possibly one-quarter of the circle may represent the volume of obvious applications, *i.e.*, applications where nothing very special in the way of new types of machines or plant changes is required. The shaded area, one-fifth of the obvious quarter, represents the trucks and tractors now in service. The exact proportions used are immaterial, as it is a fact that several times the quantity of machines now in service can be used ecônomically without creating new types or making extensive plant changes. And beyond the obvious applications are several times this amount of potential business dependent upon education and plant changes principally, and to some extent, upon improved and changed types of machines.

As concrete examples, consider the many small installations which are being used successfully by large enterprises where additional machines necessitate changes, also the many additional

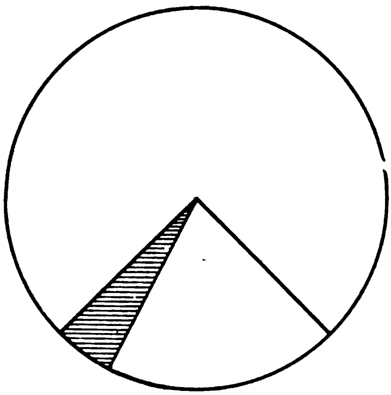


FIG. 7.— DIAGRAM OF APPLICATIONS ACTUAL AND PROSPECTIVE

small and large potential buyers who have not as yet become interested. These machines are making good and receiving much favorable comment. Cases are rare where any Industrial Truck or Tractor, once purchased and properly installed and operated, has not become permanent plant equipment.

Today a man may not be a buyer because his elevator is too small or light, his aisles too narrow, or his yard too soft. However, he is a positive future buyer if his business requires the handling of merchandise in volume. It is only a matter of time, if he is sufficiently sold to the Industrial, before he will grasp some opportunity to make the changes in his plant necessary for an efficient installation. He will be forced to do so as European labor will be needed at home and hand labor, late in khaki, is demanding and getting better jobs. He will be forced to use labor-saving machinery and the Electric Industrial is the only kind sufficiently flexible in its application for general use.

While the present costs of Industrial Vehicles range from \$1500 to \$2500 for standard machines, and the daily operating costs from \$2.00 to \$4.00, including carrying charges but not the operator, the necessary plant changes sometimes mean an added investment. This is not discouraging as a machine can replace an average of ten men. One or two machines will often repay, in six months' to a year's time, their own investment and the cost of plant changes required for their use, and will pave the way for several more machines and larger profits.

Just as the modern machine tool equipment developed from the simple lathe and drill press, with the aid of such auxiliaries as improved power transmission systems, high-speed steel-cutting tools, time studies, and factory methods, so the Electric Industrial Vehicle is rapidly developing and growing into the industrial requirements of the times. Doubtless both electricity and gasoline will be used as power for Industrial Vehicles as in the case of the road motor truck, but the proportion of electrics employed will be reversed in the case of the Industrial; as interior handling machinery will clearly be electrically driven.

Ultimately, and at no very distant date, power Industrial machines will largely replace hand-truck labor, as modern machine tools have replaced the hack-saw and the file.

Charging Current Required

We have reviewed briefly, in the foregoing, the different kinds of Electric Industrials thus far developed, the manufacturing capacity for producing them, the varieties of work they can do economically, and have also touched upon the probable growth of the industry. This brings us to the one element of the industry in which the central stations are most interested—the amount of charging current required.

The batteries vary quite widely with the different types of machines and the service for which they are used. The following sizes include the more common equipments:

Truck—12 cells 15-17 plate lead battery; 21-24 cells A-6 nickel-iron battery.

Three-wheel Tractor—16-20 cells 15-17 plate lead battery; 30-36 cells A-6 nickel-iron battery.

Four-wheel Tractor—24 cells 15-19 plate lead battery; 42-48 cells A-6 and A-8 nickel-iron battery.

Special vehicles—12-24 cells 15-19 plate lead battery; 21-48 cells A-6 and A-8 nickel-iron battery.

Relatively small batteries are used to permit machines to be made as small as possible, to operate in congested quarters and to conserve weight. It is, therefore, quite common practice to boost batteries at noon. Also, possibly 10 per cent of the Industrial Vehicles in service have dual battery equipments, and for twenty-four hour service change batteries. As a rough estimate of the average amount of charging current required per unit per day, we may take the figure of 20 to 25 kw-hr. or 6750 kw-hr. per year.

The total yearly current consumption of 8000 machines is, therefore, approximately 54,000,000 kw-hr. At the usual power rate of 2c. per kw-hr., the central station income from this source would exceed $1,000,000 yearly. This, of course, is off-peak, high power-factor load, which I believe central station operators consider several times as desirable as peak-load business from the net profit standpoint. Possibly we would be justified in saying, from a standpoint of net profit per year, that the Industrial Vehicles now in use consume off-peak current equivalent to a gross sale of $3,000,000 per year peak-load current, and in addition, the use of Industrial Vehicles speeds up production and further increases the amount of current used for other power purposes.

Central Station Influence

I have made no reference to any work central stations in general may be doing toward furthering the use of Electric Industrials, as I have little data on the subject. There is no doubt that the central stations are in position, without material expense, to contribute greatly to the rapid growth of this industry through their tremendous local influence with their customers. While primarily the central station's business is the supplying of current and not the sale of Electric Industrials, there is a strong community of interest between them and the manufacturers of such vehicles, which should not be disregarded. The gross revenue from the sale of current used by a truck or tractor throughout its life is nearly equal to the cost of the machine.

As this paper is largely a recapitulation of certain phases of the Electric Industrial Vehicle, I am taking the liberty, in closing, to summarize three definite suggestions to central stations which, from the manufacturer's viewpoint, will aid greatly the future growth of this industry.

First, make it someone's job, either through your New Business Department or other suitable branch of your organization, to acquaint your customers with the Industrial Vehicle. Get them interested to the point of looking into the various economies these machines may and probably can bring to each individual business. This may be done through your regular power solicitors, by circular letter, over the telephone, or by other local means which will occur to a live man giving the job a little of his time. Certainly the manufacturers would gladly supply you with data on their particular products. Possibly the office of the Vehicle Section of the National Electric Light Association could be induced to issue bulletins, from time to time, to its central station mailing list, presenting general sales arguments.

Second, you now doubtless have specialists who consult with the prospective users of power for various manufacturing purposes, whether they be straight motor drive, lighting, heat treatment of steels, welding, or what not. Have you anyone in your organization prepared to consult with your manufacturing customers on the use of electricity in the handling of their raw materials, work in process, or finished products? If not, why wouldn't it be worth while to encourage one or more of your Sales Engineers to visit some of the vehicle and battery manufacturers, investigate some prominent installations of Industrials, or otherwise become acquainted with all the leading makes and types on the market? I think the manufacturers would cooperate with you in every way possible to this end.

Third, encourage competition in the sale of Electric Industrials in your territory. Assist the manufacturers, from your knowledge of local conditions, to select proper sales representation, and back the Industrial Vehicle strongly with your influence, but don't play favorites. If you are to get the most out of the advertising and sales effort of the various manufacturers, it is quite essential that you be entirely neutral so far as the recommendation and sale of any particular make of truck or tractor is concerned. If you feel it necessary, investigate the manufacturers represented in your territory, test their products, and give your indorsement to all you find worthy. Be fair and impartial, and get all the sales effort going which the business can support, as the Industrial needs competition and the combined efforts of all to obtain the maximum volume of business.

THE CHAIRMAN: Are there any questions to be asked of Mr. Bartlett? (No response.)

As we are all in a hurry to go to the Pier and enjoy the program which the entertainment committee has provided, we will close without formality, but I would like to take this opportunity of thanking both Mr. Farmer and Mr. Bartlett for coming here and bringing their messages to us. The meeting is now adjourned.

FIFTH COMMERCIAL SESSION

Thursday afternoon, May 22, 1919

The Chairman, Mr. Charles J. Russell, called the meeting to order at 2:35 P. M.

THE CHAIRMAN: It has been found necessary and advisable to change the program somewhat this afternoon in view of the short time at our disposal. We have three or four matters which we can perhaps run over hurriedly while the members are coming into the meeting. One of the most important things is the report of the Committee that was appointed on the Address of the Chairman. I will ask Mr. Harris if he will present that report.

HENRY HARRIS, Pittsburgh: In the absence of the three members of the Committee, I will present the report. It is as follows:

REPORT OF COMMITTEE ON CHAIRMAN'S ADDRESS

The Address presented by Chairman Russell at the opening Commercial Section Session of this Convention, which has been carefully reviewed by your Committee, is a clear and admirable summary of the Section's activities during the past year.

Chairman Russell has not only epitomized the work of our various standing committees, but has forecast, with singular clearness and breadth of vision, many of the problems that must be courageously met and efficiently dealt with during the period of the ensuing administration, in order to insure the continued growth and usefulness of the Commercial Section. These matters, as well as the important points in committee reports, are covered so completely in the Chairman's Address that more specific reference to them is unnecessary at this time. Your Committee, however, heartily endorses the valuable recommendations made by the Chairman and desires to urge that a determined effort be made, through the proper channels, to have these recommendations put into effect by the incoming administration.

Your Committee further recommends that the Chairman's Address be accepted with a vote of thanks, and that the Secretary be instructed to send a copy of the address to each officer and executive committee member of the Commercial Section.

Respectfully submitted,

THE COMMITTEE.

THE CHAIRMAN: The Chair will entertain a motion that the report be approved.

On motion, the report was duly approved.

THE CHAIRMAN: We will now have the report of the Committee on Publications, Mr. F. D. Pembleton, of Newark, Chairman.

REPORT OF THE COMMERCIAL SECTION PUBLICATIONS COMMITTEE

At a meeting of the Executive Committee, Commercial Section, held on January 9, 1919, the Publications Committee was asked to make a careful study of the present prospective conditions that surround the industry and to resume its activities along the lines that conditions would seem to warrant.

In accordance with this plan, the Chairman of the Publications Committee sent to all members, under date of January 17th, a questionnaire relative to the conditions existing in the central station business, and requested each member of the Committee to write to the various companies in his immediate vicinity and then forward to the Chairman the information obtained.

This information indicated that central stations throughout the country would resume their new business and advertising activities during the latter half of 1919, but on a somewhat reduced scale. A summary of the information was presented to the members of the Publications Committee at a meeting held on February 21, 1919, where it was used as a basis in formulating the program for the Committee's work.

After reviewing the Committee's 1917 report, a tentative program was considered and acted upon as follows:

1—Christmas (Booklet) Folder.

Sketches and Prices Submitted. Last Booklet published in 1917. 500,000 copies sold. None on hand. Committee approved issue of 500,000 copies.

2—Industrial Lighting Folders.

Sketches and Prices Submitted, Four (4) folders suggested. A book on this subject was published in 1916. No copies on hand. Not approved.

3—Monthly Sales Campaigns

Sketches and Prices Submitted. Complete dummy, including Sales Letters, Window and Display Cards, Newspaper Advertisements and Folders on Electrical Appliances submitted. In response to questionnaire sent out in 1917, 86 Central Stations stated their desire to buy literature of this kind. This complete monthly advertising service designed to support program formulated by the Committee on Coordinate Advertising and Sales Campaigns. Committee voted to lay on table.

4—House Wiring Book—(Old Houses).

Sketches and Prices Submitted. Last Booklet published in

Manuscript of this report was received March twenty-eighth.

1917. 200,000 sold. None on hand. Requests for these books recently received. Approved by Committee.

5—"Right Way to Use Appliances"—(Folder).

Sketch and Prices Submitted. Folder published in 1917. About 500,000 copies sold. Committee approved an issue of 500,000 copies.

6—Store and Window Lighting Folders.

Similar to Industrial Folders. 79 requests for this literature in response to questionnaire in 1917. Not approved.

7—Electric Sign Advertising.

Similar to Industrial Folders. 67 requests for this literature in response to questionnaire in 1917. Not approved.

8—Publicity Campaign on Central Station Service.

What Constitutes Central Station Service—Outline prepared. 57 requests for this material in response to questionnaire in 1917. Referred to the Executive Committee, Commercial Section.

Item No. 3, Monthly Sales Campaigns, was discussed to a great extent, there being a wide diversity of opinion on various phases of the plan.

At the end of the discussion, there was a general opinion that the plan when revised would be very helpful, particularly to the smaller companies, but it was considered very doubtful if the service could be sold at the present time.

Your Chairman, and the Section's Executive Secretary, have since revised the plan, and submitted it to a number of representative members, most of whom think it could be adopted successfully with great benefit by companies which do not maintain an advertising department.

Item No. 8, Publicity Campaign on Central Station Service, was originally presented by Mr. A. J. Marshall at a meeting of the Executive Committee, Commercial Section, on January 9th, at which time it was very favorably received and referred to the Publications Committee for consideration.

The plan includes the preparation of a series of advertisements which will tell, in a simple, interesting way, the story of central station service, covering every phase from the coal mine to the various advantages derived from the uses of electricity for industrial, commercial and domestic purposes.

The Publications Committee gave the subject very careful consideration, all of the members present strongly recommending that the plan be adopted, but all agreed that the Publications Committee had no authority in the matter. On motion the subject was referred to the Chairman of the Commercial Section for further action.

The members of the Committee present at the meeting were unanimous in the opinion that the scope of the Committee's activities were not adequately expressed by the title "Publications Committee" and that the title "Publicity Committee" would be more desirable.

On motion, a resolution was passed to the effect that the Commercial Section, Executive Committee, be petitioned to change the name of the Publications Committee to that of "Publicity Committee."

The question was raised as to whether it would be necessary or desirable to redefine the scope of the Publications Committee, particularly if its name was changed to that of "Publicity Committee." This was not considered vital at this time, but the thought is presented here for consideration and action if the matter is of sufficient importance.

In an effort to eliminate the present duplication of effort and expense by manufacturers and central stations in producing literature on show-window, store and sign lighting, your Chairman was instructed to take up the subject with the various manufacturers and endeavor to secure a cooperative effort to produce literature of this nature, which could be distributed by manufacturers and central stations, making it unnecessary for the Publications Committee to publish any literature on the subjects.

On March 4th your Chairman wrote to the principal manufacturers of incandescent lamps, asking whether or not they would favorably consider such a plan. Replies have been received from the manufacturers who declined to join in such an effort.

In 1917 representatives of the Board of Fire Underwriters asked the Executive Committee, Commercial Section, to lend its cooperation in distributing educational literature regarding the careful use of electric appliances. On recommendation of the Executive Committee, the Publications Committee issued and sold 500,000 copies of a four-page leaflet, which instructed customers in the right way to use electric appliances.

Further educational work along these lines has been strongly urged, and, therefore, the Publications Committee voted to issue another leaflet, giving instructions by illustration and text as to the proper use of the principal heating and cooking appliances.

Your Committee asks that the member companies place one of these leaflets in each package containing an electric appliance sold to customers, and it further recommends that manufacturers place in each package containing an electric appliance a suitable tag or leaflet which will explain to the purchaser the right way to use that particular appliance.

Your Committee believes that if a cooperative effort is made to instruct a customer regarding the proper use of an appliance at the time when it is purchased, the number of complaints resulting from improper use will be greatly reduced.

The Sub-Committee on the Use of Manufacturers' Literature has been retained and the members will continue their efforts to prevent a waste or improper use of such material.

Respectfully submitted,

F D PEMBLETON, Chairman.

F D BEARDSLEE	J S KENNEDY
N H BOYNTON	J E MCKIRDY
W H EASTON	A C MCMICKEN
F H GALE	J C MCQUISTON
L D GIBBS	L H NEWBERT
HENRY HARRIS	C H PIERSON
A W HAWKS, JR.	M S SEELMAN, JR.
W H HODGE	P L THOMSON
D H HOWARD	E E WHITEHORNE

R R YOUNG

THE CHAIRMAN: Is there any discussion on this report?

D. H. HOWARD, Chicago: It seems to me that this new title for the Publications Committee does not fit very aptly. I should think that a better title would be "The Adverising Service Committee," to supply advertising service and counsel to the smaller companies.

THE CHAIRMAN: Are there any other comments?

HENRY HARRIS, Pittsburgh: I should like to ask Mr. Pembleton whether the Committee has decided to publish the leaflet referred to, this leaflet that is to be enclosed with the packages containing appliances?

There is one other thought that I had and that is in connection with plan No. 8. It occurs to me that such a campaign as outlined in that item would be of value not only to the public which we are trying to reach, but to men like ourselves in the Commercial Departments of the companies who, I believe, with few exceptions, do not appreciate this story of service from the coal pile to the consumers' meter. If the Committee cannot obtain authority to publish item No. 8 for the education of the public at large, then in the interest of the commercial divisions of our companies which are serving the public, we might well ask for authority to publish a story of that sort for our own education.

Mr. Pembleton: I understand Mr. Harris referred to the leaflet that the manufacturer is to place in the package?

Mr. Harris: I thought the Publications Committee voted to bring out another leaflet, giving illustrations of the matter in the text as to the proper use of appliances, etc.

Mr. Pembleton: Yes, that has been published, and is now on sale at the Registration Booth.

The Chairman: We will now proceed to the program, as changed. We all know that the standards of illumination have been cut down through restrictions which have prevailed during the war, and we all believe that the greatest field for immediate increase in revenue without extraordinary investment lies in bringing these standards back to where they should be. That is particularly true in the industrial field and we are going to be favored with an illustrated lecture upon this subject entitled, "Our Manufacturing Buy-Product" in lieu of the report of the Industrial Lighting Committee of the Lighting Sales Bureau, and I assure you it is a great pleasure to introduce to you Mr. William A. Durgin, of the Chicago Commonwealth Edison Company, Chairman of the Committee, who will present this lecture and demonstration.

(Inasmuch as Mr. Durgin deemed it impracticable to reduce his lecture and demonstration to an illustrated report for inclusion in these Proceedings, it is impossible to do anything further here than present it merely by title.)

THE CHAIRMAN: This report is open for discussion.

G. H. STICKNEY, Harrison, N. J.: If there is any one class of lighting that should be nurtured by the lighting industry it is industrial lighting. There is probably no other class in which the average practice falls so far below the best economic standards of light users. From some viewpoints, the fact that it has become necessary for State governments to enact rules to compel safe lighting intensities might be considered an indictment of our progressiveness. It seems to me that we owe it to our industry and our clients to teach not only the practice necessary for safety, but the much higher standards required for better and more economical manufacturing. Unfortunately on their present basis, the State industrial lighting codes cannot require that the lighting shall be such as to insure a high earning power for workmen. But since such a condition would be profitable to the manufacturer also, we should be able to present the facts before him in a convincing way—in other words, educate him.

What Mr. Durgin has demonstrated regarding the value of high power lighting, we have known in a general way, but Mr. Durgin has given us scientific data taken from actual results obtained under typical conditions. Fortified by such conclusive evidence, we should be able to direct the practice toward the proper standards.

The quantitative factor, however, is not the only one which needs our attention. Proper diffusion, with minimization of glare is equally, if not more important, because not so well understood. Diffusion also acts on intensity, since experience indicates that higher intensities are usually employed with diffuse lighting. Glare often limits the acceptable intensity in lighting installations, since it becomes more disagreeable in high intensity lighting. It thus leads to the popular but mistaken characterization of "over lighting" when the real fault is too high intrinsic brilliancies or contrasts. By providing a proper diffusion we would not only secure more intensive application of lighting service, but better satisfied users.

Ward Harrison, Cleveland: We all appreciate the magnitude of the service which Mr. Durgin has rendered to the industry in obtaining these actual statistics as to the increase in production that results from good lighting. Although plant superintendents have frequently furnished statements to the effect that improved illumination has increased the output of their factories, yet prior to Mr. Durgin's tests we had no real quantitative data to substantiate these statements. This material should prove invaluable as an aid in securing additional business.

There is one other point that I should like to bring up along a line that Mr. Durgin has suggested, i.e., of service to American industry. We hear a great deal among central stations as to the importance of load factor, of keeping the investment in power plant and equipment productive for as much of the 24 hours as possible. We have not heard so much about the same thing from manufacturing plants, probably for the reason that the ratio of yearly sales to total invested capital has been greater than in the central station industry, and fixed charges therefore relatively less important. However, the continuous agitation for shorter hours of labor affects the manufacturer not only from the standpoint of wages, but also because his plant is idle an increasingly larger proportion of the day. With 11 hours for a working day the load factor on a plant was up to nearly 50 per cent; with an 8-hour day it is 33 1/3 per cent, and with the adoption of a 7- or 6-hour day the plant is nonproductive for so large a proportion of the time that the decrease is actually more serious from the standpoint of idle investment than that of increased labor cost.

An investigation which we conducted in Cleveland indicates that even today from 15 to 40 per cent of the cost of a manufactured article such as you might buy at the hardware store, is due simply to overhead charges on the plant incurred during the time that the material was passed through. If still shorter hours of labor are to come the manufacturer must adopt methods already followed in the rubber and automobile industries, where it is necessary to run two shifts in order to obtain a fair return on the invested capital. To this the objections are often raised that men do not like to work at night, that good men do not have to work at night, that it is impossible to change the established mode of life, and that really restful sleep cannot be secured during the day. Of the four, this last objection is a valid one; in fact, it is an open question whether satisfactory service can ever be obtained from a shift which begins work at midnight. On the other hand, man's preference for working during daylight is in many cases nothing more than an outgrowth of the fact that until recently effective work could not be done under artificial lighting, and that amusements have gradually come to appropriate that part of the day which was otherwise unoccupied. If factories were operated on a morning and evening shift—the latter ending by midnight—the ordinary hours of rest would be but slightly disturbed, and amusements which are dependent for their success upon a man's leisure time and his money would soon adapt themselves to the change. Under these conditions one would anticipate much less objection to night employment.

If the central station man can put across the idea of daylight lighting at night he will not only secure the return on the sale of electricity for lighting, which Mr. Durgin has pointed out, but he will also find that many of his customers will then run 14 hours a day instead of 7 or 8, and that this longer hour operation will be profitable to him from the standpoint of his power sales as well.

FRANK W. SMITH, New York City: I had really not intended to take part in the discussion of Mr. Durgin's paper. I came to the meeting because, having heard Mr. Durgin before and understanding that he had elaborated on his previous presentation on this subject, I knew I should be instructed.

I hope all of the commercial men will be able to carry back with them the message delivered by Mr. Durgin. The question is, how can this be done? We cannot take back with us this wonderful demonstration with all its paraphernalia, and unfortunately, many of us cannot take Mr. Durgin's enthusiasm back with us. I hope, however, that his message will bear fruit, and that all of our commercial people will go back with a determined effort to take up this field of proper lighting energetically.

I cannot help saying that I believe our Lamp Committee has made a distinct mistake in taking the presentation of its report out of the Commercial Section. I believe more constructive work can be done by our Lamp Committee continuing to get into a more commercial atmosphere, and I hope the incoming Committee will seriously consider the advantage to the industry in presenting its report to the Commercial Section hereafter.

CAPTAIN HENRY LOGAN, New York City: In the April issue of the *Electrical World,* I read an account of the experiments that Mr. Durgin carried out recently, and it gave me an idea which I followed in the Dolphin Jute Mills at Paterson, New Jersey.

The existing lighting system there consisted of 60 watt bulbs, placed at about twenty foot intervals. On the floor on which the test was carried out, spinning of the jute was the chief operation.

The spinning machines had a critical speed which could not be exceeded, and throughout the test they were running at this critical speed. The normal lighting conditions in the shop were such that the lighting intensity was 1½ foot-candles on the working plane.

The production of the machines under the normal system was 54.9 pounds per hour, and under the new arrangement an average of 70.1 pounds per hour resulted, an increase of approximately 17 per cent. As nearly as possible, the conditions laid down by Mr. Durgin for such tests were observed.

A similar test in the same plant was carried out in which the light was increased merely by increasing the multiple reflection from the surrounding structural surfaces, the advance in light being from 0.1 foot-candles to 1.5 foot-candles, the production increasing approximately 4 per cent.

MORSE DELLPLAIN, Hammond, Ind.: I just want to say that I believe we owe Mr. Durgin a vote of thanks for this very excellent presentation of the subject. He has certainly presented some very novel features in a very original way, and I believe that as a result of his lecture, we will carry home with us the enthusiasm for this subject which has been lacking in the past.

I would take this opportunity, Mr. Chairman, to offer a motion extending to Mr. Durgin a hearty vote of thanks from the Commercial Section for his very excellent presentation of this subject.

(The motion was duly seconded, put to vote and carried.)

H. R. SMITH: I do not know whether it is out of order or not. I think the electrical people are to a certain extent at fault in allowing this bad lighting in factories, in allowing the electricians in so many cases to lay out the entire plan of lighting. The central stations are interested more deeply in the matter than the electricians, and the central station people should have more of a hand in laying out these lighting systems. Of course we do that to a very great extent. We have men who are competent to lay out the installation, but in many cases the electricians who get the job to do the wiring come more directly in contact with the owner at the time the lighting system is installed, and they get their own way more than we do on that account. We should insist in some way—I do not know how we can overcome the objection of the man who is putting the money up—we should insist strongly on having these installations installed in the way in which they should be installed. These wiring men oftentimes put in reflectors that do not reflect; they reflect in the wrong way. And they put in bare lamps where the owners should insist more strongly on covered lamps. That is true not only in the commercial lighting but in the residence lighting, where the people come in and say they want to have some lamps installed. They will be asked, "What do you want?" and they will answer, "I want so and so," and very often they will have to have just what they have asked for. I used to allow that to be done—but what I am contending for is that we should try more strongly to get them to lamp the house up as we think it should be done, lamp the factories, etc. I think we are too passive very often and allow them to have their own way with regard to their own ideas about what lamps should be used and how they should be used, when their ideas are not suitable to the requirements of the installation. I do not know whether I am right in that, but I do feel that we allow them to have their own way in many cases where we should not.

M. S. SEELMAN, JR., Brooklyn, N. Y.: It is true, as Mr. Smith says, that the electrical contractor in the average city has a great deal more to do with the illumination engineering, so-called, of customers' installations, than the average central station man, and my conviction is that one of the principal reasons why he has more to do with it is that he knows more about it—has more practical first hand knowledge concerning it.

I think one of the lessons to be learned from this presentation by Mr. Durgin is that we should teach our salesmen more about illuminating engineering than they know today.

A few years ago, prior to the war, when there was a considerable amount of agitation for the education of salesmen we used to do quite a good deal of that sort of thing, but in the last few years we have done comparatively little of it. We have not fully realized the possibilities of it. We ought to put ourselves in a position where we can take this message which Mr. Durgin has given us to the industries in our community, and, in my judgment, the proper way to do that is to teach our men, who are constantly in contact with the users of electric light, the main facts concerning the right kind of illuminating engineering. Today, in many cases, they are apparently deficient in that knowledge.

G. BERTRAM REGAR, Philadelphia: Mr. Seelman forces me to say that if it is true that the electrical contractors (with all respect to them) know more about our business than we do ourselves, then we should be ashamed of ourselves, and it is indeed time that the central stations take their lighting load seriously.

This lecture should be repeated in at least all large cities throughout the country, and the central station management and factory and mill owners and superintendents should be urged to attend.

As Secretary of the Illuminating Engineering Society's Committee on Reciprocal Relations with Other Societies, I would suggest to Mr. Seelman that the central stations give more support to that organization. It would be to their advantage. It is perhaps needless for me to say that Messrs. Durgin, Harrison, Stickney and others who have spoken are all shining lights of the Society.

I trust that message will be carried back to the central stations.

Louis Kalischer, Brooklyn, N. Y.: May I say a word as representing the guilty individual, the poor electrical contractor, who is responsible for all of the miscellaneous destructive lighting throughout the country, except in the great city of Chicago, where the Commonwealth Edison Company has the opportunity of using the services of such a wonderful man as the speaker to whom we have listened.

From the contractor's standpoint, I wish to say that the central stations, the Illuminating Engineering Society and all others interested must know that we did not manufacture any of that miscellaneous lot of junk referred to. That was given to us to sell, and we offered it for sale to the public, and we sold it to the public and received in some cases a profit thereon. The great trouble with the present day condition is that the manufacturers and the Engineering Society design certain fixtures which, unquestionably, are far above anything that were obtainable in the past: then they close the door after they have put it all down in a nice booklet, and put it in the safe somewhere, and for some unknown reason the contractor, who, by the way, is the only man who is in direct contact with every element in the industry from the manufacturer to the public, is not in a position, nor seemingly is he to be placed in a position, to get these wonderful data or to be able to realize any dividends on a presentation such as this.

If we could have this lecture which Mr. Durgin has given here today, with the demonstration, repeated in New York City, I will guarantee that every contractor worthy of the name will be present and will no doubt profit by it as well as the public. We are endeavoring to transmit to the public, in so far as possible, all of the wonderful ideas and the wonderful advancement in the industry, but if we are not given a fair and adequate opportunity, I do not think you can blame us if we hit only the "high spots."

H. H. Newman, Trenton, N. J.: I cannot agree with the speaker who said that the electrical contractor knows more about this matter than the central station man, but I believe he is willing to put into effect what he does know, while the central station man holds it back. I feel that there is a certain fear on the central station man's part that he will be criticized because he is trying to put in an installation which will cost more money for current than has been previously paid for the lighting, and he does not put into the customer's mind the benefits which he will derive from a proper installation. It is my firm conviction that if we will only tell what we know, and endeavor to put into effect what we know relative to proper illumination, we will secure better lighting, not only in factories, but in homes. I really feel that the electrical contractor in most instances is perfectly willing to cooperate with us as central station men, but we are working at loggerheads and often blame the contractor because we do not say anything to him about proper illumination and he goes to a certain extent on guesswork.

THE CHAIRMAN: If there is no further discussion, we will call on Mr. Durgin to close the discussion on the report.

MR. DURGIN: I hope that next year when the Industrial Lighting Committee reports, there will be a lot of discussion like that given by Mr. Logan. He showed a 17 per cent increase in production by the installation of proper lamps. That is the very best sort of discussion.

Replying directly to Mr. Kalisher, of Brooklyn, I will say that we had a convention of contractors in Chicago about two months ago. Mr. Kalisher came out and addressed the bunch, made up of electrical contractors and central station men, and everybody agreed that if we only had Kalisher in Chicago, what a simple matter our relations would be.

THE CHAIRMAN: We will now have the report of the Committee on Coordinate Advertising and Sales Campaigns, Mr. Henry Harris of the Duquesne Light Company, Pittsburgh, Chairman. In the absence of Mr. Harris, we will ask Mr. J. M. Wakeman, a member of the Committee, to present the report.

REPORT OF
COMMITTEE ON COORDINATE ADVERTISING
AND
SALES CAMPAIGNS

Inasmuch as the previous report of this Committee, submitted in 1917, failed to reach the floor of the Convention for discussion, it is deemed desirable by the Committee to recite briefly at this time its purpose and recommendations as then reported.

There has been a growing feeling on the part of the commercial men in the electrical industry that there are large opportunities for increasing the benefits to be derived from the advertising that is being done to create public interest in things electrical.

The large amount of national advertising being done by the manufacturers and the localized advertising being carried by the central stations, dealers and contractors with the cooperation of manufacturers, while of enormous value, has apparently failed to return the maximum benefit because of its being more or less "hit or miss" and haphazard.

A very careful review of the subject has made it appear to the members of the Committee that the advertising which is being done by all concerned—manufacturer, central station, jobber, dealer, and contractor—should have a distinct interest to the public. The very novelty of some appliance, while possibly not in itself a big money maker either in its sale or in its current consumption, can be of immense benefit to the industry as a subject around which to popularize the use of electricity.

We have, therefore, really come to consider the method of large department stores in advertising "leaders" to attract the public to the stores as being typical of the plan for bringing together all electrical advertising to create a maximum interest in things electrical.

Manuscript of this report was received March twenty-fifth.

The advertising of an electrical leader nationally, with simultaneous window displays and local advertising, will stimulate interest in things electrical and bring the people to the stores where electrical appliances are sold. Once the people are drawn into the store, if varied lines of appliances are well displayed and supported by demonstration and good salesmanship, increased sales of the entire line of appliances will follow.

The thought has not been, necessarily, that more money should be expended, but rather that the money now being spent might be used for more profit and larger returns to the industry as a whole.

On the theory, therefore, that definite drives or campaigns on electrical leaders would create a maximum of public interest in things electrical, the Committee on Coordinate Advertising was appointed by the Chairman of the Commercial Section; this committee being constituted of specialists in electrical advertising and electrical merchandising from manufacturers, central stations and allied interests.

Members of the Committee, representing electrical manufacturers spending large appropriations for advertising, agreed that the plan was practicable, and that if a schedule of leaders was made up in advance, their plans for advertising could be made to line up with it. It was felt that such a schedule should be by months, and that two general classifications should be followed, viz., Electrical Merchandising and Lighting.

Of course, the recommendations that are made are suggestive only, and not compulsory, but it is believed that to follow the Merchandising Schedule herein outlined, will aid tremendously in popularizing the sale and use of electrical appliances, and to follow the Lighting Schedule will greatly stimulate increased and extended uses of electrical energy. Such manufacturers as have more or less extensive lines may wish to advertise not only the leader, but other appliances at the same time, and this can be done easily by simply giving the leader in that particular month a prominent position in the advertising and subordinating the other lines to it.

In some months, the leader scheduled for the month can not be used by some manufacturers, because they do not make it. In such cases, naturally, they will advertise as they have in the past such of their goods as they wish to push especially at that time.

Summed up, the plan does not remove any privilege or give up any advantage that manufacturer, central station or other interest has enjoyed in the past through the independent placing and scheduling of advertising, or promotion of sales campaigns. On the other hand, however, the coordinating of the advertising and sales efforts is bound to bring benefits because of the intensity of the campaign, having the attention of the public focused on specific articles making a definite appeal in terms of human interest, rather than in haphazard display of a full line, perhaps illustrated and titled, with little information that will appeal to the general public.

Your Committee at its several meetings considered the problem of selecting the subjects of leaders for each month, upon which the manufacturers and the dealers might best concentrate. Thought was necessarily given to the season when the articles would sell the best.

It should be borne in mind that it is not intended that the schedule presented by the Committee shall be considered obligatory, but rather, that the whole schedule shall be merely suggestive. Those who take advantage of and properly carry out the plans for coordinating sales and advertising campaigns will doubtless receive increased benefits.

Proper consideration was also given to the matter of selecting leaders each month that would be popular and appeal to the people generally. The purpose of the leader is to get the interest of the people and bring them to the stores where salesmen and other forces can have opportunities to sell their lines, on which, perhaps, there are greater profits for the dealers, and better current earning possibilities for the central stations.

The Committee in 1917 submitted a Merchandising and a Lighting Schedule, which, from all reports, were quite freely adopted and followed by central stations and other dealers of electrical appliances, during the past two years. Reports from various sources, however, indicated that some slight modifications could well be made in the merchandising program, and the Committee now submits the following schedules, in which these changes have been incorporated:

MERCHANDISING SCHEDULE

January—Clearance Sale.
February—Heating Pads.
March—Vacuum Cleaners.
April—Sewing Machines and Sewing Machine Motors.
May—Grills.
June—Irons.
July—Fans..
August—Clearance Sale.
September—Washing Machines.
October—Radiant Heaters.
November—Toasters.
December—Electrical Christmas Gifts.

LIGHTING SCHEDULE

January—Better Lighting.
February—Outdoor Lighting (tennis courts, playgrounds, etc.).
March—Stores and Windows.
April—Residence.
May—Electrical Advertising (signs, outline lighting, display lighting, etc.).
June—Public Buildings.
July—Industrial.
August—Stores and Windows.
September—Electrical Advertising (signs, outline lighting, display lighting, etc.).
October—Residence.
November—Better Lighting (with emphasis on office buildings).
December—Industrial.

A monthly reminder will be sent to the member companies six or eight weeks in advance of each monthly special sale or drive provided by these schedules, and the complete schedules will be printed on the back of each reminder so that they will always be easily available. It is proposed to list on these monthly reminders the companies which supply advertising matter on the appliances or devices appearing on the schedule. Only manufacturers, however, who are members of the National Electric Light Association will be listed.

With these reminders reaching our members six or eight weeks in advance of each anticipated drive, they will be enabled to obtain such advertising matter as they may care to use in supplementing the manufacturers' publicity. These reminders will be further supplemented by special articles in the N.E.L.A. BULLETIN, and manufacturers will be asked to coordinate their advertising with these schedules as far as possible when making up their advance plans for publicity.

Respectfully submitted,

Henry Harris, *Chairman*
N H Boynton
J E Davidson
W L Frost
F H Gale
L D Gibbs
D H Howard
J G Learned
H N McConnell
J C McQuiston
F D Pembleton
C J Russell
M S Seelman
P L Thomson
J M Wakeman

THE CHAIRMAN: Is there any discussion on the report? If not, we will take up the next report, which is that of the Committee on Merchandising, Mr. E. R. Davenport of the Narragansett Electric Lighting Company, Providence, Chairman. As Mr. Davenport has a very bad cold, we will ask Mr. A. J. Marshall to present the report.

REPORT OF MERCHANDISING COMMITTEE

In presenting the report of the Merchandising Committee this year, I am calling to your attention only the strictly new additions to the 1915 report. The Committee was of the opinion that this entire report should represent a text book on merchandising electrical goods, and recommends that the incoming and successive committees from year to year us it as a foundation to be improved upon, rather than attempt to present a new report each year disregarding former ones.

With this object in mind, the Committee took the 1915 report of the Merchandising Committee and brought it up to date as much as possible in the limited time at its disposal, this being accomplished through the splendid cooperation of a number of sub-committees appointed to revise the 1915 Report as well as to develop the new subjects herewith set forth, synopses of which follow.

Cost Accounting

Probably the most important addition is the report of the Sub-Committee on Cost Accounting, which is brief but thorough. The Committee found that no two central stations which are supposed to know the cost of operating their Appliance Department agree as to the details. This Committee's report indicates three important things: first, to sell to the Appliance Manager the idea that he should know his true cost of operating his department; second, to give to the Appliance Manager an idea of what factors make up the true cost, as per the standard practice in other retail trades; third, to point out to the Appliance Manager and his superiors the fact that unless the central station knows its true cost of operating its Appliance Department, the company would be in a position of unfair competition, which is not a good strategic position for a central station to be in these days. This unfair competition will take the form of a lack of knowledge of true costs. The importance of this lack would be the fact that other branches of trade with which the central stations are in competition have already worked out these costs.

The Goodwin Plan

One of the greatest trade development activities is now being promoted throughout the country. It is a subject of utmost importance to all central stations, and those companies which have adopted the Plan report increases in their business as a result. The Committee hopes that at this meeting reports will be made by central stations having experiences which will verify the results claimed.

The Committee finds that opposition by central stations to the Plan has been due to a misunderstanding and lack of knowledge of the subject. This is very unfortunate indeed as it has been responsible for retarding the development of our own business. Special attention is called to the portion of the report urging that the central stations in particular do their utmost to foster, promote and develop branches of the electrical industry where team work and cooperation do not exist, and must exist if we are to develop our business to its highest efficiency.

The report of this Committee is very brief, and I urge every member not only to read it but to digest it and make it effective in his respective community.

Standardization of Cords and Plugs

For years we have been handicapped by the numerous varieties of attachment plugs on appliances. I am sure that without much elaboration on my part all our members appreciate the advantage to the public, manufacturers and dealers of the standardization of cords and plugs. The Wiring Committee for the past few years has worked very closely with the Merchandising Committee towards the solution of the problem. If the members will read the report of this Committee and act upon its suggestion, it will bring us just so much nearer the time when we will have a complete standardization of cords and plugs.

Trade Discount and Margin of Profit

The margin of profit on which we sell electrical merchandising is a very important subject. Sufficient attention has not been given to it in the past, largely due to the attitude of some central stations which were not interested as to whether or not their Merchandising Department showed a profit. These companies have gradually seen the error of their way and are more interested now than ever before in having their Appliance Department conducted on a strictly up-to-date merchandising method, the same as is being done in almost every other line of business. Owing to this previous lack of interest on our part, the manufacturers have drifted into a sort of rut whereby the central station has educated the manufacturer to believe that we were not interested in the margin of profit allowed on the sale of goods. The result is that both parties have not sold as large an amount of goods as would have been possible under modern practices.

The Committee has gone into this subject in a very thorough manner and the attention of manufacturers as well as central stations is called to this report, in which considerable food for thought will be found.

Merchandising Tungsten Lamps

It is very interesting to note the trend of the times on this subject. Taking the total manufacturing output of tungsten lamps in this country, it is claimed that the majority of them are sold on a merchandising basis. We can all recollect that only a few years ago the majority of lamps were furnished on a so-called free renewal basis. Today there are only a very few of the larger central stations in the country that have not changed over their policy in this respect, and even in some of those companies modifications have been made in the way of charging for the delivery of free renewal lamps, etc.

It is interesting to note the experience of one large central station after it had eliminated tungsten lamps from its rates for lighting service and placed them on a strictly merchandising basis. It was found that the central station sold more lamps in the community than it ever gave as free renewals, and careful and accurate records kept show higher wattage lamps in use in the sockets than previously, resulting in more lamps being purchased from the lamp manufacturer, more lamps sold by the central station and also a larger income to the central station by the use of larger sized lamps.

Merchandising Table and Floor Lamps

There is a tremendous field for the sale of these commodities. Companies operating retail electric shops in numerous cases find that the profit on the sales of these lamps is very satisfactory, so that it is advisable to push energetically the sale of this class of goods aside from the question of revenue to the central station, although it will be found to be a small factor in that direction. The tendency of the times is to have a portable table lamp in most of the rooms in homes, as a part of the furnishing as well as for illumination purposes. There are many homes in which two or three portable lamps are used in one room. This fact has been recognized by many of the leading electrical merchandising men who have started a campaign for energetically pushing the sale of lamps which has already met with pleasing and surprising results. The Committee hopes that more companies will become interested in this problem.

Style Merchandise

We have long been handicapped by not having enough different items for sale. We have also lacked a style appeal to attract the women to our stores, and it is the women's business that we are almost wholly catering to as far as electrical merchandising is concerned. The women are attracted to other stores on a style appeal, the changes in styles, etc. As far as electrical merchandise is concerned, there has been little if any style goods. Your attention is called to the report of the Committee on this subject. As far as is known, it is a matter that has never been brought to your attention before and it deserves full investigation.

Cooperating With Committee on Coordinate Advertising

Your attention is called to the report of this Committee recommending an advertising schedule which it is hoped that all interested in the sale of electrical merchandise will follow.

Help to Small Central Stations

This is a subject which has frequently come before many of the meetings of the National Electric Light Association. In the limited time which this year's Committee had, it was impossible really to do justice to this subject. However the Committee made certain recommendations which it is hoped can be carried out and developed further in the future.

Publicity

The Committee has arranged for various parts of this year's report to be presented from time to time through the columns of the trade and technical press, as well as through the medium of the Association's Bulletin, the object being to distribute such information monthly throughout the year, not only to stimulate interest in this important subject and keep it continually before the industry, but it is believed that in this manner the members will have more opportunity to consider the various phases of merchandising than they would have at a convention by trying to absorb the entire report in addition to the numerous other important reports presented. Copies of the 1919 Merchandising Report will be made available through the Publications Committee, Commercial Section. It is suggested that N.E.L.A. members secure copies of the report for local distribution to dealers in electrical merchandise who need the valuable information contained in the report, as well as for distribution among their own Commercial Department employees.

It is suggested that Class D manufacturing company members purchase from the Association copies of this report for their salesmen to utilize in educating their customers to modern merchandising practices.

The Committee also recommends that next year in the formation of committees, appointments be made whereby a member of the Merchandising Committee can represent that Committee in the Accounting Section or vice versa, especially with that committee of the Accounting Section dealing with Merchandise Accounting. In other words, each Committee should be dovetailed with the other so as to facilitate the work of both Committees.

Unfinished Business

We recommend that the incoming Committee take up the following matters to which this year we were unable to give the required time: table of annual income on various electrical merchandise, such as washing machines, etc., cooperation with National Contractor and Dealers' Association, standardization of electrical appliances, electrically equipped furniture, recent developments. The above represent unfinished business and it is hoped that the incoming Committee can give these subjects its consideration.

In closing, I wish to thank every member of the Merchandising Committee for the faithful and very energetic work which they put into this year's report. I hope that the gentlemen present will show their appreciation by joining in a very lively discussion of the subjects presented.

Respectfully submitted,

E R Davenport, *Chairman.*

MERCHANDISING

ANALYZING THE MARKET

Communities differ. There is no one best way of selling electrical merchandise. The central station has two problems in selling this class of goods: First, to supply existing demands; second, to create new desires and as these develop into demands, to supply them. The latter come into existence by educating the public to a demand for electrical appliances. Your problem is different from that of the ordinary merchant. Possible customers are limited to the consumers of current.

To sell electrical merchandise at a profit it is necessary to analyze the market. By analyzing you obtain information that enables you to reduce the cost of creating a demand, and to reduce the sales expense per appliance sold, also information which helps you to get maximum sales.

In this report we shall check and analyze the market in three ways: First, the customer's financial condition, second, the customer's psychological condition or mental attitude toward goods to be sold, and third, the physical information regarding the devices in operation and the location thereof.

FINANCIAL POINT OF VIEW

You can roughly class your household customers this way:

(1) People who do not use the appliances themselves; whose household work is done by servants and appliances are not necessarily considered household necessities;

(2) Families with average incomes, the women of the household doing most of the work and buying appliances for their utilitarian value, for their value as conservers of energy and time. This group offers the greatest possible opportunity for successful merchandising effort.

(3) Households in which electric light is considered a luxury and a monthly bill of $1.00 or $1.50 a big item. They appreciate the value of electrical appliances but cannot afford the capital investment or the cost of operation.

The percentage which each of these groups bears to the total number of household consumers of electricity differs with every company. The merchandising man must make an estimate of conditions as they exist in his own locality. This approximation should be used in basing regular sales expenditures and in laying out campaign work. In a community where the electric light customers may be divided into 10 per cent, first group, 50 per cent, second group, and 40 per cent, third group, it would be a mistake to spend 75 per cent of the sales effort in endeavoring to reach the first group. Better 25 per cent aimed at Group 1, and 75 per cent at Group 2.

The various lines of electrical goods are manufactured to appeal particularly to one of the three groups. This must be remembered in buying. Base your purchases and estimate your volume of sales upon a knowledge of the percentage each class bears to the whole. As an example, the store manager has $5,000 to spend for portable lamps with three lines, one ranging around $75, one around $15 and the third around $5. With the ratio of customers outlined above, $500 can be spent for the expensive line, $2,500 for the middle-class line and $2,000 for the third line. In actual practice with portable lamps, $1,000 could be spent on the first group, $3,000 on the second group and only $1,000 on the third group.

There are several alternative methods for making this financial classification. The third group is usually found in a definite neighborhood. The customer's ledgers should be checked by occupation or neighborhood. The salesmen should check their sales records from information obtained by personal calls, and divide the prospects into three classes. The type of house lived in, whether apartment or private house should be known. If an apartment, information as to the rental paid can be obtained from the landlord or renting agencies.

PSYCHOLOGICAL OR HUMAN INTEREST POINT OF VIEW

A knowledge of the type of woman representing the average for each class will be of value. This information is particularly helpful in making up advertising appeals, in designing general effect in a display room as a help in buying, and in employing sales people who can best handle the trade. Department stores cater to a particular class. All their sales work aims at a hypothetical average woman. They check their prospective trade financially, socially and in some cases on the basis of nationality. For instance, the general appeal made in a Dutch community would be different from the appeal made in a Jewish community, granting that the financial standing of the customers was the same. In other words the appeal is based on the known rapidity of response.

The analysis has been overlooked by the lighting companies. This information can be obtained by interviewing representative women and getting data regarding the use of household labor-saving devices, the size of the family, number of servants, stores traded at, social connections, occupations, and the number of wage-earners in the family. As an example, the type of store traded at is one of the greatest helps. People of the same class trade in similar stores. By getting the methods used by the merchants who sell to the same people the central station wishes to reach, you should have no trouble in giving the proper tone to window display advertising, in lining up the prices to be obtained for your merchandise, type of clerk needed, methods of display and general sales appeal. As an example, an exclusive shop appeal is based on giving the impression of individuality, of items for sale not in common use. The middle-class store selling labor-saving devices bases its big selling talk on the general utility of the appliance, making quantity display and impressing upon customers that they must have the devices to get the most out of life.

Another psychological classification is based on mental attitude.

(1) There are people who know what they want and come to get it. As an example, the woman who wants to make her ironing easier makes up her mind that she wants an electric flat-iron, comes to the store and demands that particular device.

(2) There are people who know their wants but do not know what will supply them. As an example, a woman desires to make toast for breakfast, but does not know whether to buy a grill or toaster, or a disc stove with a special wire screen; or she wants to get an electric appliance for a gift, but has not made up her mind what device it shall be. In selling to the first class the clerk is acting as an order taker, and is to a great extent an order taker for the second class.

(3) There are people who enter a store with no particular concrete desires; they have not made up their minds to buy or

perhaps have already bought one thing, yet have a latent wish for something else of which they are not cognizant. Here is the salesman's opportunity to show real salesmanship.

No sales organization should ever consider that its men are efficient until they can get a big percentage of returns from the type of people described under the heading of Class 3.

PHYSICAL ANALYSIS

It is advisable to know the appliances already on the lines. One way of getting this information is to make a house-to-house canvass and find out the kind of devices in use, from whom purchased, when purchased, and at what price. This information is valuable when the central station starts a merchandising department. By finding out from whom electrical goods have been bought, the appliance manager will know with whom to cooperate. By knowing the price paid he will have definite information in setting his own price schedule. This information is of particular value in a small place where the customer is apt to make his purchases in the near-by cities. Impress upon the men that "sugar is a better information getter than vinegar." Tactful questions make and keep the good-will of the prospective customer and will always bring out the information required. In addition note the appliances in which the customers are interested, for use in advertising follow-up, and as a prospect list for sales work. Record should be kept of appliances out on trial, and all appliances sold should be added to the card record system. The following card form is very satisfactory:

PROSPECTIVE APPLIANCE SALES

Name
Address

Appliance	Serial Number	Consigned Date	Sold Date	Returned Date	Salesman Name	Repaired Date

(6 in by 4 in)

These cards should be filed by streets. A separate card file can be kept of consumers who have moved and are not on the company's lines, or for some reason have discontinued the use of electricity. A certain percentage of these people at some future date will again become consumers of electricity, and a record of the appliances which they have in their possession will be of value.

These record cards should be used as a basis for all sales work. The point of saturation should be noted before commencing campaigns on a given appliance. Sales expenditure should be based on the saturation point. Keep your card records under the direct charge of the appliance manager. This information is of value in circularizing. It increases the percentage of returns by eliminating follow-up work on existing users of the device, and furthermore divides the prospects into groups based on appliances in use. For example, in a vacuum cleaner campaign it will be found that the users of flat-irons can be followed several times with profitable results. They are more receptive to sales work than are the consumers who use electricity for lighting only. This applies to all other appliances.

FACTORS IN CREATING A DEMAND

Everything which creates a desire for electrical appliances can be called a factor in creating a demand.

The relative importance of the methods discussed below varies in different localities, depending mainly upon the prospective customer's knowledge of electrical goods. This information is obtained by analyzing the market, bearing in mind the devices in use, the customer's attitude toward labor-saving devices, and the financial condition of the average family.

In planning local work, consider also the time-attention that will be given to the different methods. As an example, newspapers are read for a few minutes, weekly papers during a long period, and the monthly magazines for a still longer period. This is technically called the "time-factor." The small town weekly newspaper is supposed to be kept in the home and read until the next issue appears. However, newspapers in small towns near big cities do not have the same "time-factor," due to the local circulation of the city dailies.

The local mediums, such as window displays, newspaper advertising, circularizing, etc., must be analyzed, bearing in mind the many demands on the attention of the prospect.

In creating a demand always use terms that the average woman will understand.

National Advertising by the Manufacturers.

The large manufacturers of household lines have been advertising for some time. As compared with the national advertising done by manufacturers of other goods, the work is efficient. The mediums used, such as the *Ladies' Home Journal,* the *Saturday Evening Post* and the *Woman's Home Companion,* have a large circulation in some of the best homes throughout the country. In a general way the value of this advertising is indirect. A direct return can be obtained if the central station will tie its local work to the manufacturers' national work. (See "Advertising" section of report.)

Local Newspaper Advertising.

All advertising should be educational; newspaper advertising is no exception to the rule. It is apt to be the first method used by central stations, and is the most flexible advertising medium. Bear in mind that rates for space vary in different cities. The expense of this type of advertising should be carefully checked, as the length of time newspaper copy is alive and attracting attention is short. Do not expect too much from a single advertisement. In advertising unknown specialties be prepared for considerable educational work, and do not expect too much from the newspapers. They should be followed by some other means for creating a demand and making a sale. Newspaper advertisements are particularly effective for featuring reductions in price when the original price is well known, and for educating people in a knowledge of your goods so that they will come to your store for further information.

Lighting Company Show-Windows.

These are a valuable sales help. The big merchants consider their show-windows a powerful element in making sales. One department store gives each foot of the window display a percentage of the overhead charges, and expects certain definite returns from every item shown in the window. Keep your windows clean. Display your merchandise of household goods to please the women-folk. Watch the successful merchants and copy their methods. (See "Window-Trimming" section of report.)

Circularization and Use of Mailing List

Every consumer of current is a possible prospect for electrical goods. This mailing list has no waste of circularization. This is an important method for creating demand and should be studied in the light of information obtained from your analysis. Use circulars and mailing matter which appeal to the average customer. Your methods of circularizing should not duplicate those of other merchants.

Maximum results come from appropriate circulars and careful classifying of the general list into live prospects. Better fifty live leads for a vacuum cleaner than 5000 circulars to your entire mailing list.

A word of caution! Do not use too many of the same kind of circulars. Vary the kind of circular and the method of sending, mailing with bills, with form letters and as bill stickers. At times plain circulars or educational booklets dealing with general subjects, not aimed at selling a particular device but designed to create a general knowledge of electrical goods, are effective. Western farmers buy from catalogue houses. A central station wishing to sell appliances would find the cost of sending a salesman prohibitive. Circularizing is an inexpensive and effective method of creating a demand, particularly in conjunction with the demonstration and display of goods at the local trading centers. Do not order circulars which you may not use. Do not make up folders or booklets when the manufacturers will give you what you want gratis.

Have a rack for holding the circulars to be distributed over the counter. When kept in loose piles many are wasted, and they give the store a slovenly appearance. In distributing make the customer feel that you are giving her a booklet worth reading; that it contains an interesting message worthy of careful consideration. In nine cases out of ten, the customer will base her value of the circular upon the way it is handed to her by the clerk.

Demonstrators and Sales People

Every member of the sales staff is employed to sell merchandise. Every person talked to should become interested in at least one new appliance. The salesman who sells one article and does not lay the foundation for another sale is only 50 per cent efficient. The whole organization should help to create a demand for electrical goods.

As the outside salesmen have a big opportunity to help, make it worth their while to talk electrical appliances. They can talk of the value of the different appliances on a more personal basis, as in many cases they are known by the householder and their opinions have considerable weight. They are also of value as "fix-it men." A cord repaired on the premises may mean an electrical flat-iron in use during ironing day.

Have your store clerks use appliances in their own homes. It gives them a better knowledge of the goods, and an opportunity to get domestic criticisms, which make for more enthusiastic salesmanship. A man who has had his morning coffee made by an electrical percolator can talk from experience. The customer will feel the difference. Make it easy for the customer to ask questions. Answering questions intelligently is a form of teaching; it helps to create a demand.

Devices Already in Successful Operation

The old saying, "The best advertisement is a satisfied user," applies particularly to electrical goods. In the past an air of mystery has surrounded the electrical apparatus, which has not as yet been entirely overcome. By having the majority of customers using some kind of an electrical device all thought of danger will be eliminated. Every appliance sold will sell one other within a year. Some merchants claim they can afford to lose money on the first sale as the repeat orders offset the loss, provided the appliance was sold clean; that is, to a person who can afford to use it, knows how to use it, and who is convinced that it will do the work the best way. One appliance helps to sell other appliances in the same household. In a middle-class family, the use of an iron increases the knowledge of electricity, and makes possible the sale of an electric percolator with less sales effort.

Dealers Who Sell Similar Apparatus

We all know that the point of saturation for electrical merchandise is far from reached. When you consider that every appliance sold has repeat order value, the local dealers can be looked upon as a sales asset. They have show windows, do newspaper advertising, have trained clerks and have the good will of the community, based on a reputation for having served their customers satisfactorily. Furthermore, the fact that reputable dealers sell electrical goods acts upon the prospective customer as a guarantee of reliability and carries the impression of standard use.

A manufacturer of dish-washing machines, advertising in the *Saturday Evening Post,* featured the fact that John Wanamaker sells his product. In this case the manufacturer was cashing in on an established reputation.

As long as the retail price schedule agreed upon is maintained, consider any store selling to the women-folk an adjunct to your advertising department. If the dealers should sell 1000 devices, a large percentage of repeat orders would come to your store unsolicited.

In the rural districts it may be possible to get the local merchants to feature and display the items campaigned. This would have the same value as a branch store.

Miscellaneous Sales Schemes

There are many good schemes which help to create demand. The idea carried out must be relevant to the work in question. In selling flat-irons stay with this subject. Do not confuse customers with other things not associated. A negative effect should be avoided, and anything which detracts from the general sales plan is negative. One central station designed an electric truck in the shape of a flat-iron and drove this around the city. It was attractive, caused considerable comment and made sales.

The Bell Telephone Company has put out an attractive booklet called "Selling by Telephone" which outlines many telephone sales schemes, and several eastern companies are experimenting with this form of sales service. This work will probably be found most effective when the sales people using the telephone are personally known by the customers.

Many companies make a point of giving talks before women's clubs on the uses of different appliances and their value in the home. With the growth of Domestic Science Departments in the public schools, considerable work can be done there.

One gas company made a point of demonstrating its ranges before church congregations, meeting in the Sunday-school room. The announcement was made from the pulpit.

A novel vacuum cleaner advertisement was to place a carpet on the sidewalk in front of the show-window, with a sign in the window stating that at a definite time the carpet would be cleaned and a prize given to the person who guessed nearest to the exact weight of the dirt removed. Another vacuum cleaner demonstration consisted of driving around the city a truck on which was a colored maid demonstrating the different uses of the cleaner.

The system of giving every employee of the company a lead book in which notations will be made regarding prospects for appliances, people interested in service, complaints, etc., has merit. These lead sheets are to be turned in to the department head and from there distributed to the interested departments of the organization. By this method every employee feels his responsibility as a representative of the company and many sales will result from this informal method of creating a demand.

MANAGERIAL POINT OF VIEW

Modern business methods demand that organizations be separated into departments and particular individuals be held responsible for particular tasks.

Segregation of Responsibility.

Hold one person responsible for the ultimate success or failure of the appliance department.

There are three classes of lighting companies from the point of view of the sale of appliances:

Class A. The small company will not require the entire time of one person. However, one individual assumes the responsibility for profit or loss, and reports to the general manager. Other employees working in this department are under his direct charge. Helpers should be trained, and their time charged to the appliance work when so occupied. The organization should be so arranged that at certain seasons additional salespeople and helpers can be placed in this department. When necessary, outside salesmen can be brought in to work behind the counter.

Class B. In cities of middle size the merchandising manager spends his time in the one department, assisted by several helpers, including salespeople, stock-men, repair-men and delivery-men, depending upon the volume of business. Have the sale of the merchandise entirely separate from the sale of current, and give your merchandising men free play within the general policies set by the company. A person to handle this work successfully should be qualified by experience in selling household commodities to women, a general knowledge of store methods and an elementary understanding of electricity. The assistant buyer in the house-furnishing department of a department store is apt to have the proper qualifications, obtainable at a fair salary.

Class C. Many of the big companies in which one man who is held responsible has several assistant managers for branch stores or different departments of the work, have already established definite policies. The work can be handled as outlined under Class B, except that the volume being larger there will be more details and additional departments. All individuals working in this department should look to the appliance manager as their superior, and report directly to him. Keep the lines of authority well defined. The manager should know at all times the profit or loss made by his department.

Segregation of Statistical Information

Keep all records of this work separate from other branches of the business. The results of each clerk's work should be easily obtainable. This is particularly valuable for use during campaigns.

Companies must expect to lose money at first, but by keeping careful records leaks can be stopped. Improvements will be made from a knowledge of the mistakes.

The general manager should receive specific data with comparative figures as a check upon the merchandising man. In figuring profits do not consider revenue derived from current consumed. Sell your appliances as a separate commodity. Hold one man responsible for results, and give him records whereby his success or failure can be definitely measured and his tendencies noted.

DETAILED HANDLING OF RETAIL SALES

Inside Sales People—Their Training and Point of View.

For handling retail salesmen consider this policy:

First—Base salary on the gross volume of merchandise sold. This is easily done when the salesman spends his entire time on the floor selling. If only part of the time is spent this way, judge of his selling ability by his effective sales hours.

Second—Have advancements made on a basis of gross business plus ability to cooperate with associates.

Third—Create a feeling that this work needs the best that each individual can give; that there is advancement ahead.

Fourth—Employ only people who will make good; do not use this department as a dumping ground for the inefficient. The employee should show the same ability here as elsewhere.

Fifth—The manager should put enthusiasm into this work. Do not consider it a side issue. It can be used as one of the biggest helps in getting good-will.

The United Cigar Stores Companies have 1000 retail stores. They have won out in a competitive field. The key to their success has been the efficiency of their sales people. This work is under the direct supervision of the vice-president, all of his time being devoted to it. The motto of the Companies might well be: "Salary based on sales made; to the customer, always courtesy and service." The watch-word is: "The customer is the boss. He pays your salary. We want his repeat orders."

Display of Merchandise in the Sales-Rooms and General Effect Created

The general impression should be pleasing. Make the customer feel at ease. Give the impression of a pleasing anxiety to sell goods. A successful general effect is based on an analysis of the likes and dislikes of your average prospective customer. Understand her financial problems. Offer goods within her reach. You can afford to copy the methods pursued by the successful local merchants.

Size of Store

For the ordinary company, the store is that part of the office which is set aside for the sale and display of electrical merchandise. In estimating for size, the stock and its attractive display, the customers and the clerks must be considered. The electrical store should be large enough to hold comfortably the average number of customers. A store of the proper size makes it easier for the customer to buy; easier for the clerks to sell, thereby reducing the size of the selling force; allows closer contact of the salespeople, making for enthusiasm and increased efficiency; gives the place a more business-like appearance and reduces miscellaneous sales and handling expenses. Check your present department and see if the space used is not too large and could not be given up in part for other purposes, thereby increasing the efficiency of the entire organization.

Companies planning to open a department should study carefully this phase of the work, estimating their anticipated volume of business and the average number of customers that may be expected to enter the store at one time.

INVENTORY AND PHYSICAL HANDLING OF STOCK

Inventories

Inventories are necessary, as they show the value of the stock, the rapidity with which it moves and its physical condition, and check up on unsalable items.

Physical Handling of Stock

Use a bin system with a bin for each article. The name of the article and the manufacturer's number, with the maximum and minimum stock limits should be placed on 4 by 5 inch cards fastened to the top of the bin in small tin holders. Bin data should agree with the card records kept in the perpetual inventory system.

Keep the merchandise clean. Expensive pieces, such as chafing dishes and percolators should be re-buffed by manufacturers whenever tarnished. The large companies could afford a small buffing wheel. Do not have stock so low that you cannot give satisfactory service to customers. One company uses Canton flannel bags for holding portables and highly polished items when in the stock room.

Have a systematic, orderly, intelligent stock clerk. Have him keep the place in such condition that you will not be ashamed to take your most particular customer through it. Proper care will keep goods from deteriorating. Insist that the stock clerk follow the old rule of "A place for everything, and everything in its place."

REPORT OF SUB-COMMITTEE ON MERCHANDISE ACCOUNTING

A knowledge of his *true* cost of doing business is absolutely essential to the central station merchandise man who expects to operate his department successfully over a period of years and meet fairly all forms of local competition.

The problem of this Committee is to give the merchandising man an idea of the various classes of expense items which must be included to arrive at a true knowledge of costs, and the general reasons why these expenses must be included.

This report deals exclusively with the merchandising work of the central station. It does not take into consideration any of the other sales work undertaken by the commercial department.

However, your Committee is not interested in the names that are given to the various accounts or the detailed methods by which the merchandising costs are handled in conjunction with the accounting system of an individual central station. This latter phase of the subject is a matter of the "Merchandising Accounting Committee" of the Accounting Section.

To give the central station merchandising man the fundamentals of true cost work, as applied to his department, we have taken for our authority a standard method used by department stores and other long-established retail outlets.

The rule here is that a true knowledge of merchandising costs must take into consideration three cost factors:

(a) Operating expenses.
(b) Fixed expenses.
(c) General or administrative expenses.

We list below a simple classification of merchandising expense accounts grouped under these three divisions with a brief explanation of each account.

Operating Expenses:

Selling salaries
Bonus
Buying expense
Advertising
Delivery
Freight and express
Store supplies
Department expense
Repairs of appliances.

Fixed Expenses:

Rent
Light, heat and power
Taxes
Insurance

Administrative Expenses:

General expense
Management
Office expense
Postage, telephone and telegraph
Interest
Depreciation
Short and over.

Before explaining the function of each individual account, it may be said that all operating expenses deal with the cost of running the store—this includes every expense connected with the buying and selling of merchandise. The fixed expenses show what it costs to maintain the plant in which the business is conducted, while the last group deals with the administrative expenses and with those general expenses with which every business is confronted.

OPERATING EXPENSES:

Selling Salaries. This account carries the amount of salary paid for selling merchandise, stockkeeping and so forth. This should include a major part of the merchandise man's salary—in some cases it would include all his salary.

Bonus Account. This account is used when commissions or bonuses are paid in addition to regular salaries.

Buying Expense. This account would be charged with all traveling expenses in reference to the buying of merchandise.

Advertising Expense. This account would carry the total amount of all advertising expense, including postage for sending out circulars.

Freight and Express. This account is charged with the transportation on all merchandise which is bought.

Delivery. This account carries all delivery charges, including postage for sending packages to customer, wages of delivery men, depreciation on delivery equipment, etc.

Store Supplies. This account represents the amount of supplies, such as wrapping paper, salesbooks, twine, etc., used in the store.

Department Expense. When a store is departmentalized, this account absorbs all kinds of general expense which can be charged directly to any department. For instance, if special cloth bags were used to wrap portable lamps when in stock, this expense would be charged against the portable department through the Department Expense Account.

Repairs of Appliances. This covers all expenses connected with repairing and servicing electric appliances for which no charge is made to customer.

FIXED EXPENSES:

Rent. This account absorbs the rent paid for salesrooms and for the office space used by the department. When buildings are owned by the company, an inter-office rent charge must be made based on the proportionate value of space used.

Light, Heat and Power. This account is charged with the department's share of the light, heat and power service used.

Taxes. This account carries the personal property tax assessable against the department.

Insurance. This will cover the insurance paid on the stock and the fixtures of the department.

ADMINISTRATIVE EXPENSES:

General Expense. This account is charged with all kinds of expense which cannot be classified any other way, such as wages of janitors, subscriptions to mercantile agencies, trade journals.

Management. This account carries all elements of general management of the department, including that part of the merchandising man's time which is not charged to selling, advertising or any other part of his work, except management. It also would include a fair part of the expense of managing the company as a central station. This latter expense might be prorated on a basis of the ratio between the gross income of the merchandise department and the central station business, as a whole.

Office Expense. This includes all office expense necessary in the running of the department, including the proper part of the total accounting expenses—auditing, bookkeeping, collection, credit, etc.

Postage, Telephone and Telegrams. This account carries that part of the postage expense which is not charged to advertising or delivery, as well as telephone and telegraph expense.

Interest. This will include interest on the amount invested in furniture and fixtures, as well as interest on working capital invested in merchandise stock and accounts receivable.

Depreciation. This account is charged with the depreciation on furniture and fixtures.

Short and Over. This account deals with any shortages or overages that may exist when the cash account is balanced at the end of each day.

In building up a set of accounts to show the true cost of operating a merchandise department, the titles and arrangement given to various accounts are not a factor, neither are the number of sub-divisions under a given heading, to wit: take the account "advertising" as outlined above. This account might be sub-divided into "advertising space," "advertising salaries," "window dressing materials," "window dressing salaries," etc. What is desired is a true report as to the cost of handling only the advertising work of the department, advertising being one of the direct operating expenses of the merchandising business. In other words, it is not the case of how accounts are classified, but it is a case of including *all* of the proper expenses.

The majority of the central stations that have given any consideration to this question of merchandising cost include only their operating expenses. A few companies include certain of the fixed expenses, but there are not over a dozen companies in the country which know their true merchandising costs, in the sense that all the proper administrative expenses are charged against this department.

It is standard merchandise practice among the more established retail trades to refer to the cost of doing business as a percentage of the selling price, the sales price of an article in all cases being par.

This cost percentage is arrived at by dividing the total expenses for a given period (preferably one year) by the total sales for the same period. Unless the administrative and fixed expenses are included in making up the total of expenses, the percentage figured will be incorrect, and the so-called figure representing the cost of doing business will be fallacious.

There are two broad reasons why a central station should know it true cost of doing business.

First: As a matter of public policy, it savors of unfair competition for a central station to be in competition with dealers who have figured their costs correctly, but who cannot offset losses resulting from their merchandising business by profits from the sale of current.

It is urged in the industry that there is a need for an electrical retail trade to cooperate with the central station in the development of the use of electrical labor-saving and style devices. As the total volume of retail sales increases and as more new devices are put on the market, the discrepancies between the central station's cost figures and the trade's cost figures will become more apparent, because on those lines where the resale prices are not set by the manufacturers, the central station will be constantly underselling its competitors or else raising its prices to conform to established local schedule, which will give the central station an exorbitant mark up based on the manufacturers' prices.

Second: It is possible for most central stations to include all costs and yet make a profit on their merchandising business if they have live managers.

Ordinarily, live retail managers are never developed except under competitive retail conditions, and the best form of competition is a cost sheet that tells the whole truth and nothing but the truth.

Thinking in terms of net profits means not only increasing the volume, but keeping expenses down. As a matter of general information for the man who wishes to operate his department on a true cost basis, he will find that operating expenses increase in direct ratio to the volume of sales, that fixed expenses remain practically stationary and that overhead or administrative expenses increase but gradually.

Using the work already done by the Merchandising Accounting Committee of the Accounting Section, it is possible for any central station to find out the true cost of running a merchandising department without, in any way, changing its present system of bookkeeping. All of the merchandising accounts would come under Account 508 (electrical merchandise and jobbing revenue) per N. E. L. A. standard classifications of accounts which were adopted in 1914.

Respectfully submitted,

H A LEWIS, *Chairman*
F A BIRCH
R E FLOWER
D R SMITH
W S WALLACE

USE OF REGULAR LIGHTING COMPANY SALESMEN FOR SELLING APPLIANCES

The lighting company salesmen are in constant contact with the public, and have entrée into many homes, can act as "fix-it men," and hence should sell appliances.

Ordinary merchants do not have this machinery for making sales. Pay your salesmen a commission on the sales made, with a smaller commission on leads turned in which result in sales. In no case figure the commissions on the amount of current consumed. Educate the men to talk and sell appliances that have the greatest utilitarian value from the consumer's point of view.

In many cases, salesmen can use appliances as a talking point toward having houses wired.

REPAIRS AND GENERAL SERVICE

Many of the best American merchants have adopted the policy of "money back if not satisfied." The appliance department should give service for service's sake. If possible, forget the value of appliances as consumers of current when handling the public. This attitude will help to overcome the latent feeling that the electrical store has an ulterior motive for selling goods over and above the profits made on the sale. There are still some people who feel that an adjustment is made to the meter when a device is placed in use. Once a bank clerk bought an appliance from the lighting company and later, returning it for credit, bought the same device from the manufacturer. He was very well satisfied with it but did not want the lighting company to know he was using an appliance as something special would be done to the meter.

The central station should guarantee all electrical parts for one year and should keep a stock of elements on hand, making no charge for the local repairs but returning the defective elements to the manufacturer for credit. In repairing parts, such as cords, not covered by guarantee, make the necessary adjustments and charge the customer for time and material plus an overhead charge, preferably at predetermined prices. Should the customer complain, state the company's side of the story and appeal to the user's spirit of fairness. In nine cases out of ten the customer will agree to the charge and have more respect for the company.

Have a bin for each day of the week, one marked "Rush for today," another "Awaiting parts from manufacturers," and another "Held for future information." Put items for repair in the proper bin; you can then tell automatically whether repairs are being handled properly. A record of repairs made will be an aid in deciding what line to purchase.

Separate the repair from the stock department. For this work get a bright young man. Make him appreciate the necessity of giving customers good service, as there is a big opportunity here for making friends for the appliance department.

INSTALLMENT PLAN OF SELLING AND COLLECTING

The lighting company has an advantage over the ordinary merchant in that it knows its customers and is in a position to estimate credit risks. The monthly bills make an ideal collection system, calling for a minimum amount of additional bookkeeping.

By the installment plan, the middle and poorer classes can purchase devices, where the capital investment would be too large if the entire purchase price were required in one payment. The installment plan is particularly valuable for Christmas purchases as the electrical store can be made a shopping center for the entire family, the payments being spread over several months.

One company cooperates with the contractors on the installment plan, by assuming collection responsibilities on devices sold by the latter.

When selling on the installment plan, the Committee recommends that at least 5 per cent be added to the regular list price to take care of interest and carrying charges.

AVOIDING LEAKS AND LOSSES

Fire—Proper precautions should be taken and necessary insurance carried.
Help—In employing help, set your standard high. Pay just salaries and expect the best returns; under no circumstances take people with doubtful reputations; have employees bonded.
Care of Merchandise—A reliable and efficient organization will keep at a minimum, losses from careless handling, breakage and poor packing.
Waste—Watch the use of supplies, wrapping paper, twine, stationery.
Unsalable Stock—Hold the manager or the buyer responsible for these losses. A bargain counter will keep this loss down.
Waste of Light—Watch this in the stock and repair departments.
Delivery Department—With proper study of deliveries the work can be scheduled and little opportunity given for losses such as goods lost in transit and damaged in wagons; time lost in routing deliveries and used improperly; lost containers, boxes and crates. In some companies the delivery man is held responsible.
Salesmen's Errors—Incorrect change, wrong addresses, wrong discounts may be avoided by training salesmen.
Waste of Time and Labor—Careful supervision of salesmen and helpers by reliable employees will correct this.
Sales That do not Stick—As a rule such goods are not sold properly. The salesmen do not consider customer's best interest, do not find out whether the device in question is the best for the case.
Customers Who do not Come Back—Successful merchandising is based on repeat orders. If your customers do not come back, analyze carefully your policies, your methods and your goods.
Ignorance of Stock—There is no excuse for this. It is intolerable.
Selling Appliances for the Wrong Voltage—This causes repetition of handling and annoys the customer. Provide salesmen with schedules.

CAMPAIGNS

Necessity of Campaigns

Human nature demands variety and change. It is only the new, the different, or the unusual that attracts attention and excites interest. Nature's law of habit makes the ordinary, the every-day occurrence, pass unnoticed. Consider this in making your sales plans. Change your method of attack. As proof of this, note the successful department store, with its continuous array of special inducements, reduced prices, special service and other attention-getting methods. In every store some sort of a change must be made.

Arrangement of Campaign

The central station's problem is different from that of the ordinary store. It must keep the good will of the local merchants and cooperate with them. They are factors in creating a demand which the lighting company must not ignore.

Electrical merchandise is adapted to seasonable selling. The work commences in early spring. The spring and summer season, from April to August, offers an ideal time for flat-irons, grills, percolators, toasters, and other household labor-saving devices, such as vacuum cleaners and washing machines, the special talking points being their comfort and their convenience. Electric fans would naturally come in at this season.

The fall, September and October, offers an opportunity for pushing electric radiators, portable lamps, percolators, toasters, and vacuum cleaners. Beginning the first of September, there are many cold days and evenings, when a small-sized electric radiator is a household necessity.

January, February and March are a special season for selling heating-pads. From the user's point of view, there is no device which gives as much satisfaction as a heating-pad. By working with the doctors, hospitals and nurses, an opportunity is offered for doing a nice business in an off-season.

Particular emphasis should be put on the value of electrical merchandise as Christmas gifts. The "shop early" idea can be featured. The success of this campaign depends on the length of time it is run. Sell appliances as gifts in November and in December. Friends will tell each other what they are giving as presents, which helps to make repeat orders.

Some concerns maintain a perpetual bargain counter on which shop-worn articles are offered at special prices. This appeals to the shopping instinct and reaches a class of people that could be reached by no other method.

Length of Campaign

This depends on the merchandise sold, the community, and the enthusiasm of the sales organization. No campaign should be carried on after the attention and interest of the customer has ceased. By changing the method of attack it is often possible to re-stimulate the enthusiasm of the trade, and increase the length of the special sale.

Dual Effects

Remember, any campaign works two ways. It excites the interest and enthusiasm of both buying public and sales organization. No individual can keep at concert pitch 365 days in the year. If a worker's efficiency could be charted, it would show plateau periods, followed by periods of rapid advancement. A campaign offers a legitimate means for stimulating individuals to increased activity. Not unless the sales manager has had actual experience with this psychological stimulant, will he appreciate the necessity for campaign methods. Take the case of the Sherwin-Williams Paint Company. By a special booster campaign in an off year with the organization already up to standard, it was possible to exceed all former records, both in sales of the individuals and in the organization as a whole. The secret was enthusiasm, the spirit of the game, which was engendered throughout the entire company. It has been said that business is the medium which absorbs the fighting instinct of the average individual. If such is the case, it is by campaign methods that the lust of combat is brought to white heat.

Cooperation of Retail Stores

Local merchants active in selling appliances should be protected during the campaign period, say by consigning a limited amount of merchandise to them with the understanding that they will display the goods in their show-windows and will follow the general plan of procedure mapped out by the lighting company, receiving a fair commission on any orders they may turn in. In this case, the dealers act as brokers and as branch show-rooms for the central stations. During a campaign get as many points of contact with the trade as possible. The accumulated effect of many displays will be another factor in creating a demand and making the sale a success.

Estimating Cost of Campaign

On the supposition that the appliance department is run on a straight profit or loss basis, the average central station should expect to lose on most of its campaigns. A careful survey of the expenditures and a definite appropriation should be allowed before starting a special sale, this appropriation not to be exceeded. From an accounting standpoint, treat each campaign as a separate thing, and include in it all expenditures and revenue received to show the exact profit or loss. As a rule, it will be found that a campaign will greatly stimulate the business done in other merchandise. The total volume of sales on the regular lines should increase 10 per cent with well established companies, or a higher figure for new companies that are doing a smaller volume of business. After the campaign is finished do not discontinue the sale of the appliance in question. Such things as flat-irons should be sold the year round. Let the public know in advance when the cut in price will be made and under no consideration make concessions after the special period is past.

BUYING

The buyer is an interpreter. It is his task to supply the existing demands of his customers, and to satisfy latent desires which become active by educating his prospects. Electrical appliances would not be in such general use if buyers had not divined what could be used, or if the sales department had not created a demand.

Base your judgment upon your analysis of the market, considering particularly financial conditions, the general attitude taken by your customers toward labor-saving devices, and the appliances already in use, remembering their repeat-order value.

The majority of your customers are women. Consider whether the goods will be appropriate for use in their homes. The average customer reasons from the known to the unknown, hence, buy household specialties which are simple and like the things the women already use.

In figuring profits to be made, consider the rapidity of turnover and the discount. If one manufacturer offers 33 1/3 per cent and his goods move three times a year, the proposition is better than a 40 per cent discount where goods will turn over only twice.

The appliance manager should be responsible for the purchasing of all electrical merchandise. Unsalable pieces should be looked upon as errors in judgment on the buyer's part.

The buyer must interpret quality in terms of what the majority of his customers can afford to pay. The design and general type of the device must be based on the likes and dislikes of the general public, but in all cases purchase reliable appliances.

ADVERTISING

The Value of Advertising

Large and small merchants in staple goods advertise every day in order to accomplish a maximum amount of sales. It is logical that large and small merchants in electrical goods can and should use the same method to create a greater demand for electrical appliances.

It is not long since electric appliances were thought to be novelties, but through the educational advertising that has been done, they have become articles of daily use in thousands of homes, in city, suburban and rural territories; but there are a still larger number of homes where electric appliances have not yet been adopted. In order that electric appliances may be sold to all homes in which there is electric service, every central station company that sells electric appliances should supplement locally the national advertising of the manufacturers.

Central station managers should remember that advertising, if properly planned and conducted, is educational as well as productive of sales, and, therefore, the effects of continued advertising are cumulative, resulting in the building of a steadily increasing volume of sales. A great many people will only glance at an advertisement, reading just the heading; others will read the advertisement many times before deciding to buy; others will decide to buy, but will forget to do so; but all the time these readers are being influenced subconsciously by the advertisement, and latent interest is being developed into action by satisfied buyers telling their friends about the appliances. In this way, through the force of suggestion, people are being educated to believe that they need electric appliances, and sooner or later they will buy and use them and come to know that electric appliances are necessities.

Capitalizing the Manufacturers' Magazine Advertising

The principal manufacturers of electrical appliances advertise very liberally in the popular magazines to create a demand for their respective goods.

The combined circulation of the magazines very thoroughly covers those parts of the country where there are the greatest number of electrically equipped homes.

The advertisements are prepared by highly trained advertising specialists and most of them are illustrated in an exceedingly attractive manner. Many of them cover whole pages and some are spread over two pages.

The magazines containing the advertisements are usually read at the home, or club, in the evening when the readers are at leisure and in a very receptive mood. A reader can hardly miss the well-displayed advertisements, some of them highly colored, and few women will pass over an advertisement on household labor-saving appliances without at least a casual reading.

If the advertisement arouses sufficient interest to induce investigation of the appliance, the reader naturally looks to see where the appliance may be seen, and nearly all of the advertisements published by electrical appliance manufacturers now direct the reader to buy from the dealer.

It is at that point that the cumulative effect of a dealer's advertising manifests itself. When the interested reader comes to the words, "buy of your dealer" or "for sale by electric lighting companies and dealers" he at once thinks of the dealer whose name has most frequently been impressed upon his mind in connection with the sale of electrical appliances. So, if a central station, or dealer, maintains constant local advertising service, it will reap a real benefit from the national or magazine advertising of the manufacturers, and the central station, or dealer, that maintains the most persistent and most prominent publicity will secure the most benefit.

Localizing the National Advertising.

Most of the manufacturers who advertise in the magazines provide what are called "dealer helps" to supplement each of the magazine advertisements. For instance: if a manufacturer is advertising a vacuum cleaner, particularly if there is to be a special campaign during a certain period, he will provide all dealers who sell the cleaner with complete newspaper advertising copy (in the form of electros) that has been written, illustrated and arranged to harmonize with the magazine advertisements on the cleaner. The manufacturer will also provide the dealer with very attractive multi-colored show-window cards, trolley-car cards, cut-outs, folders and inserts; some manufacturers will provide lithographs for billboards.

In many instances, these "dealer helps" are very much more effective than those which the central station or dealer might create locally because they conform to the general design of the magazine advertisements. This similarity of design and appeal in the "dealer helps" enables the local dealer to take up the line of suggestion which the reader received from the magazine advertisement and carry it through to a successful conclusion by drawing the reader to his store and there demonstrating the various features mentioned and illustrated in the magazine advertisements.

Individuality in Advertising

Every business or store possesses a distinct standard of individuality which is expressed in everything pertaining to the store: the construction of the show-windows, the window displays, the equipment and arrangement of the interior, the goods offered for sale, the type and manner of the salespeople, the service rendered the customers, and the advertising.

Recognizing this fact, some central station managers, and dealers, prefer to use specially prepared advertising material which shall reflect the firm's standard of quality and service.

The central station manager, or dealer, who has the facilities for producing original, individual advertising may develop to the maximum the three functions of dealer advertising:

To maintain and increase the firm's reputation and prestige;

To capitalize the sales influence of manufacturers' national magazine advertising;

To increase sales.

The first is accomplished by the standard of dignity, quality, tone, attractiveness and truthfulness expressed by the advertising.

The second is accomplished by using in the advertising some of the designs used in the manufacturers' advertising; as specially made designs in which the advertised article is the dominating feature; a prominent display of the manufacturers' trade-mark, or trade-name.

The third function is accomplished only through a careful presentation of the princpal selling points expressed in a convincing manner and through the cumulative sales influence of the advertising.

The Sales Value of Neutral Advertising

During the early development of the electric appliance business a number of central station managers accomplished a large volume of appliance sales with the aid of advertisements in which no specific make of appliances was mentioned. That was because people then knew comparatively little about electric appliances and housekeepers had not yet become familiar with any particular make. Under these conditions, educational advertising, which did not mention any particular make, issued by a firm whose honesty and judgment a customer could rely upon, would usually be more effective than advertising literature published by a manufacturer whom the customer knew little or nothing about.

Because of the great variety of makes and the similarity in design of such appliances as irons, percolators, toasters, grills, curling irons, heating pads, vibrators and air-heaters, customers frequently seek and accept the advice of a dealer when making a purchase of any of these appliances. Therefore, a central station, or dealer, with a reputation for reliability can now exercise a powerful sales influence with carefully prepared "neutral" advertising, particularly in the sale of appliances requiring a great deal of educational advertising.

The Advertising Plan

The advertising plan should, of course, closely follow and support the selling plan, and both plans should be outlined in advance for the entire year.

The best results will probably be obtained if the advertising and selling plans are based upon the schedule decided upon by the Committee on Coordinate Advertising and Sales Campaigns, because many of the manufacturers and central stations have adopted that schedule.

Various Methods of Advertising Locally

A central station may use advantageously any or all of the following methods of advertising: Newspapers, letters, booklets, folders, trolley-car cards, billboards.

Directing the Advertising

The kind of advertising that a central station, or dealer, issues will have a marked influence. It will either make a favorable impression and increase the company's prestige and sales, or it will make an unfavorable impression and have no sales influence at all.

Therefore, every central station or dealer should place someone in charge of the advertising. The work is of such importance that the sales manager can well afford to assume the direction and responsibilities associated with this major phase of merchandising. However, the person assigned to the work should be one who possesses, to a marked degree, the qualifications that naturally fit him for the work of advertising manager. He should make a careful study of the various phases of advertising in order that the best results may be obtained.

It is practically impossible to give any general rules regarding the amount of money that a company should spend for advertising electrical merchandise. During the early promotional period—when the *idea* is being sold—a larger percentage of the total sales should naturally be appropriated for advertising; however, when the idea *has been sold,* and a general demand created, then it may be found that a smaller percentage of the gross volume of business will be adequate, *provided* proper advertising methods and mediums are employed.

SHOW-WINDOW AND INTERIOR DISPLAYS

The industry has made rapid strides in show-window advertising during the last few years. Evidences of this can be seen on every hand. With lighting restrictions in effect for the war period and lightless windows lining deserted business districts, the merchants in general had to turn back to the old conditions prevailing before electricity became such an important factor. As a result of having to do without them, the value of well-lighted windows has been impressed in a way that it might not have been in long years of educational effort.

To stimulate action, the central station should see to it that its window lighting is brought up-to-date and made the best example of lighting in the community. If this is done, the next door neighbors must fall into line or their windows will appear "dingy" in comparison. The desire for better and more light will spread through an entire district if some one takes the lead. Obviously the leader should be the merchant selling light—the central station.

One use of show-windows that has unlimited possibilities for central stations is for matters dealing with points which they desire to place before the public, other than those dealing with electrical merchandise. With photographs, comparative drawings and graphic charts the extent of effort required to furnish twenty-four hour service can be shown. Other displays might illustrate the miles of wire, the forest of poles, the number of men, amount of coal, and various other features.

Photographs of the welfare and educational work of the company would serve as displays that would be both interesting and enlightening to the public. Another could show photographs of the officials of the company with a few lines regarding the work they do to furnish Electric Service. A "getting-acquainted display" it might be called.

Where a controversy exists, as sometimes happens in spite of the best intentions, a frank statement through a window display, with the facts portrayed in a concrete way, will make a host of adherents.

To attain the best results, a window should be set aside for permanent use in this educational way.

There are enough points about electric service that the public would be interested in knowing to supply themes for a year's campaign. Such publicity would be of material aid in making stronger the good will a public service company deserves when it is serving its patrons well. This method of using the show-window is worth consideration.

There are few set rules to guide the display man in his work, but there are principles that should be observed if the best results are to be obtained. Aside from an artistic eye and deft workmanship, the only other requisite of a successful display man is common sense.

The window display that is made on artistic lines will attract favorable attention, because the knowledge of the masses as to the fitness of things is much greater than is generally supposed. All people may not be critics but they are unconsciously attracted to an artistic display. It is fortunate that there is harmony between the artistic and the practical. The public is pleased and merchant is benefited by the practical artistically displayed.

The general public is composed entirely of possible customers, but only the pleased element can be considered as probable purchasers. If the public receives favorable impressions from the show-windows it has been brought to a condition of mind which must always precede purchase. The display has secured its "good will" as well as its attention. The public expects modern service from central stations as well as from other merchants, and one essential of this service is a modern store front and window display. The same methods apply in the sale of electric service or drygoods. The appearance of the store front goes a long way in determining the standing of the business in people's estimation.

People prefer to trade in an attractive shop. It is natural to patronize the store with a good front, so the central station's store-front publicity should be kept up to the standard set by the best stores in other lines. Frequently the big rental paid for a location where the greatest number of people pass, for displaying merchandise in show-windows or store interiors in an attractive manner, undoubtedly results in many sales both directly and indirectly. The indirect result is slower but a favorable impression may be made that some time later will result in sales. If the store front is not selling merchandise, the location is not serving every purpose it should. Every inch of street frontage is valuable, more valuable than any other space in a store.

Displays The show-window is one of the strong connecting links between the business and the public. None of the aids in building up retail business should be given greater credit for direct results than a display behind the glass.

The purpose of the show-window being to sell goods, a display should always carry a selling "punch" which should *never* be sacrificed.

A frequent mistake made by the inexperienced is to make the display "flat." The merchandise at the back and on either side should be elevated on pedestals to give height to these parts. The heaviest part of the display should be in the center. Unless goods are very small, when merchandise is placed too near the glass the effect is not good.

Store-Front Publicity Store-front publicity takes in not only the shop itself, but every exterior feature that draws attention to the front or even the building itself. An electric sign should be a feature in store-front publicity. Light has converted many a street from obscurity and brought many a store into prominence. The example set by the central station is likely to be followed by merchants. The central station shop-window should be the best lighted on the throughfare to make it a standing advertisement of the value of good lighting.

Store-Front Construction The show-window comprises (1) the exterior parts including base, glass, frame-work, top and store-door and (2) the interior parts, ceiling, floor, background and the lighting system. All of these should be carefully constructed if displays are to be effective. The general practice is to have the base 18 inches high for best dressing. The store door should be impressive in pattern and should have a large plate-glass panel and a 10 or 12-inch brass "kick-plate." For the entrance or vestibule, a floor of colored rubber or other tiling with the name inlaid adds greatly to the appearance. The best quality of plate glass should be used for the window and should be kept immaculately clean both inside and out. The frame-work of the window should be neat and strong, preferably of metal, which is practically indestructible. Because of the possibility of breaking or cracking, "butt-end" glass construction is losing favor, a metal corner bar being preferred.

Window—Ceiling Where the store ceiling is high it is difficult to make an attractive window display without using a false ceiling as there is practically nothing to fill the upper part of the window and the result is a barren appearance. A false ceiling is usually placed at a height of about nine feet from the floor of the window and should be of wood panelled or beamed. Such a ceiling limits the range of vision to the display space.

Window—Background The window itself should be divided from the rest of the shop by a partition or background of such height that the interior of the store is not visible, as otherwise the interior diverts the attention of the observer.

The background serves to make the display stand out, and gives an opportunity for proper illumination because the full effect of the light can be concentrated on the goods shown. It need not be of mahogany or other expensive wood; composition board will do very well. This is a wood-veneer of mahogany, oak or other hard wood, and a backing of roofing paper or wood pulp. This board comes in pieces eight feet or more long and four feet wide, is light in weight and takes paint readily.

A plush or other hanging can be used instead of a permanent background, but is likely to be dust-laden most of the time.

The background should not be too dark as this causes reflection of the street on sunny days from the glass, making it impossible to see the display. Five to six feet from glass to background is a good depth.

Window Floor The appearance of the floor of the window will do much to enhance or detract from the appearance of the merchandise shown. A hardwood floor of oak with a parquetry border is the best for all purposes, is easy to keep clean, and with care will look well for years. Frequently a dark green carpet is used with a parquetry border. Linoleum may be had in parquetry patterns and when shellacked and varnished serves very well.

In the rear of every window electric base receptacles should be inserted in the plateau to provide connections for appliances. In the ceiling permanent outlets should be provided for lighting fixtures.

Window Illumination The value of a show-window is increased greatly at night in two important particulars, viz.: The mind of the observer is freer at night than during the hustle and bustle of the business day and hence more sensitive to impressions, and the drawing power of the window is greater because of the contrast between the window and its environments. It is therefore of first importance to illuminate the display properly. Lamps should be so placed that the light cannot enter the eye directly from the luminous center since the pupil of the eye adjusts itself to the brightest spot in the range of vision. If the pupil is contracted by direct rays from the lamps the goods are necessarily less visible.

The reflection of light units from the back of a window detracts from the value of the display. For this reason a matte finish should be installed, or, if the upper section is of glass to permit the passage of daylight, a curtain should be arranged to cover the glass when light units are used.

Many of the best stores have fine window-illumination marred by a distinct line of reflected light on the background.

Conclusions All light sources should be (1) concealed, (2) as near the front of the window as possible, (3) high enough to be out of the range of vision, and (4) equipped with deep opaque reflectors, completely covering them. (5) The wattage should vary from 15 to 25 watts per sq-ft, dependent upon the location of the store (on or off a main thoroughfare) and also upon the color of the display. (6) Units should be controlled by not less than two switches, so that different intensities can be secured, and by a time-switch.

Fixtures The display man can do very little without proper window equipment and accessories, fixtures and decorative material to draw from. Metal and wooden fixtures suitable

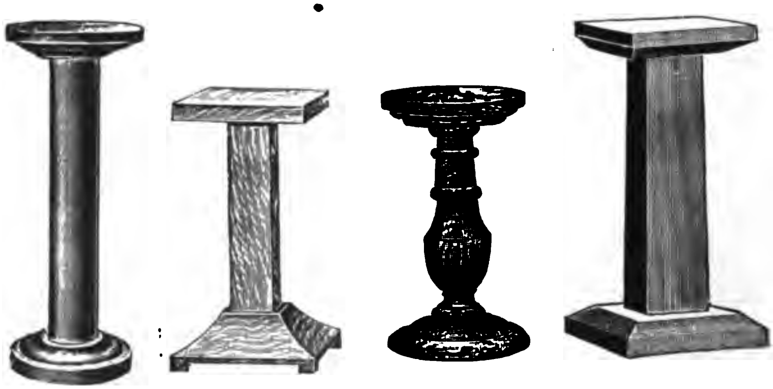


FIG. 1—TYPES OF PEDESTALS

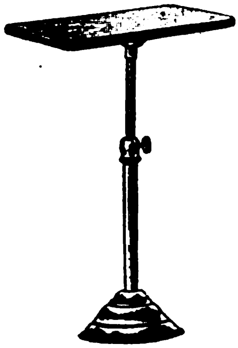


FIG. 2—FLAT TOP STAND

for every display need can be purchased at a very reasonable cost. Probably the most necessary are pedestals, used to support

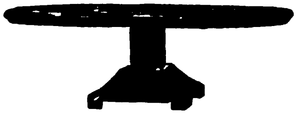


FIG. 3—PLATEAU

shelves for electrical appliances. By using such pedestals a display can be built high in some parts and low in others and

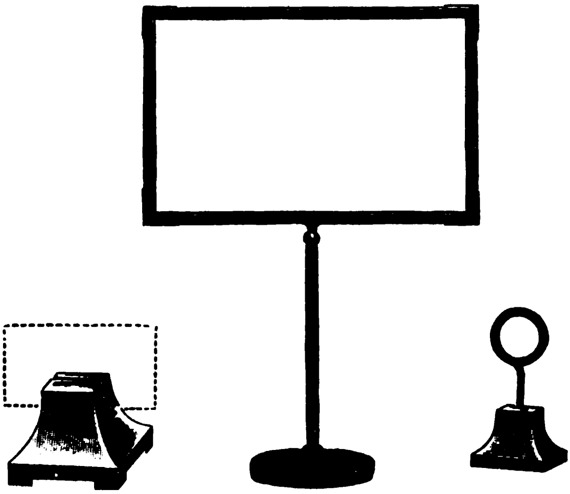


FIG. 4—CARD HOLDERS

thus do away with the flat, uninviting look that is very often noticeable. Pedestals are made from hard wood, finished to match any desired color, generally in either mahogany or oak. The pedestals should be 12, 18, 24, 30 or 36 inches high.

It is a good plan to have a set of circular shelves ranging from 18 inches to 36 inches in diameter, as well as oval, square and oblong shelves of heavy plate glass or cut from composition board, painted or covered with crepe paper, sateen, denim or burlap. Glass pedestals are very attractive and may be had 12, 15 and 18 inches high, or ordinary glass candlesticks such as can be bought at "5 and 10 Cent Stores" may be used. Portable platforms that fit together to make different sizes will be of service in displaying large devices such as washing machines, ranges, etc. A shadow-box is very useful for the display of some leader or special article.

Metal card-holders in ¼ sheet (11 in. by 14 in.) and ⅛ sheet (7 in. by 11 in.) sizes will serve to hold the show-card.

Velour or plush adds a "rich" appearance to the display when draped over the floor and around the pedestals. Other materials are silkaline and sateen, but these fade very quickly, while the velour or plush is fast color.

Artificial flowers and foliage are not expensive and add much to the appearance. The average man or woman is susceptible to beauty and the display that is made attractive with touches of color makes a stronger appeal.

A small room should be provided for the storing of the window properties when they are not in use. This will save much time and will keep the materials in much better condition than is possible when no special place is provided.

Cost of Display While all expenses should be kept down to a reasonable basis, it is inadvisable to allow too small a sum as the windows are likely to lose in selling value far more than the dealer will gain by his saving. An extra dollar or two spent on a display may often be the means of turning a mediocre display into an attractive sales producer.

The display should be in charge of some one who has an aptitude for that kind of work, who is allowed to work out his ideas and given time to put in the displays during the day.

Change of Display In most cities a display does more selling in one hour at night than in three or four in the daytime, hence the display should be changed during the hours in which it is least effective, usually the morning. A regular time should be set aside each week, a schedule of changes planned ahead and this arrangement adhered to. No display should be left in a window more than one week, as most of the people have passed in this time and the display loses much pulling power.

"Unit" and "Full" Displays The manner of displaying merchandise generally followed is to make either "unit" or "full" displays. A unit display can be one group or several groups of merchandise. The unit method of handling merchandise depends for its effectiveness on the handling of each piece or group. Full displays are those in which all available space is taken up by the merchandise without reference to the relations of the different items to each other. The unit arrangement is the newer and better way and it is especially adapted to displaying electrical merchandise. Care must be used in making unit displays to have plenty of space between the units. A crowded window bewilders the beholder. Each unit should consist of related devices. By making units of this kind, a desire for the group is created instead of for one individual piece.

Window trimming is salesmanship display; the selling points must be apparent to the public, just as the selling points are brought out in a talk. The same common sense that is applied to other forms of selling will aid in making displays that sell merchandise. Probably no line of merchandise offers greater opportunities for effective displays than electrical merchandise.

Moving Exhibits Electric light and motion displays and the general interest of the public in anything electrical give to electrical displays a tremendous advantage over other kinds. Many beautiful effects can be obtained by the use of colored miniature lamps or larger lamps when colored and attached to a flasher. Spot lights may be used to advantage occasionally when it is desired that certain objects on display be made prominent. Used in connection with a flasher to throw on and off the regular window lamps, parts of the display can be brightly illuminated while the remainder is in semi-darkness.

Mechanical displays are excellent attention arresters, as the eye is unconsciously attracted by life and motion. The small

Fig. 5—One Attractive Way to Feature Lighting Equipment

FIG. 6—FEATURING ELECTRIC CLEANERS IN A WAY THAT TELLS A STORY

FIG. 7—DISPLAY FEATURING SEASONABLE EVENT, ST. VALENTINE'S DAY

motor offers opportunity for creating many moving displays. An electrically operated turn-table on which electrical merchandise is attractively arranged, is a good feature to use occasionally. Several devices on the market automatically show a succession of display cards, used with catch advertising matter.

One large company has as a permanent feature of its displays an impersonator. For example, this man during Edison Week impersonated Thomas A. Edison very successfully. In connection with a display of electric fans during the summer he impersonated an Arab in an Arabian desert and at another time an Eskimo in a North Pole window. In another very effective window he impersonated the Goddess of Liberty Enlightening the World, as a reproduction of the statue in the New York Harbor, in connection with the introduction of the 1000-watt nitrogen lamp. When making a sale of vibrators, which up to this period had not been satisfactory, he appeared as a trained nurse. The window was dressed to represent a doctor's office, showing sterilizers and other necessary paraphernalia. On a chair was a wax figure of a man. On this subject the trained nurse demonstrated the various uses of the vibrator. The first day this display was placed several vibrators were sold and seventy prospects obtained, and the sales of vibrators were stimulated for at least a month. These demonstrations have been carried on at irregular intervals so that the interest thus created may not die out. Good results have been obtained on each article demonstrated in the window from time to time.

Where it is impossible to have a live demonstrator, a wax figure can be used to advantage. These figures can be made to appear very life-like when posed with such devices as electric cleaners, etc. To produce sales results the mechanical feature must be of such character that it calls attention to the merchandise shown rather than to itself. Care must be taken that the demonstration be of such character that it does more than attract a curious crowd. It must be carried out in a way to drive home the value of the appliance shown.

Good distinct photographs of appliances in actual use, neatly framed or mounted and used in connection with the appliances displayed, aid greatly in creating a desire, particularly those showing devices in use in the home or office.

FIG. 8—SELLING THE FAN IDEA

Many appliances are so constructed that they can be taken apart readily and the various parts shown. In planning window displays this feature should be used, as the sooner the public is enlightened as to the construction of appliances the quicker results will be derived from their sale and use.

Interior Displays Interior displays should further the buying desire created by the window. People frequently purchase not only the article for which they came in but many other things; if these be attractively displayed. It is well worth while to use much the same care on interior displays that is used on the show-window. Every inch of space that is used for display purposes should have the devices grouped in an attractive manner. Sight is a most potent sense to appeal to in selling, and every minute a customer is inside the store a desire for something displayed should be created. Wall and floor cases are used, proper tables, all are of great service. Wherever cases are used, proper lighting should be a part of their equipment. It is an excellent plan also to mark goods in plain figures.

Dealer Helps Many excellent suggestions and much good display matter are furnished free of charge by manufacturers. Much of this material has been wasted through lack of interest, but a careful survey of it will convince the electrical dealer that most of it can be used to excellent advantage.

Decorative Features Decorative features should be used occasionally to give a different appearance to the background.

Merchandise itself can be made to look somewhat different by changes in arrangement, but in order to attract the attention of the passer-by, there should be some unusual feature, either of color, treatment, background arrangement or setting. The electrical dealer must rely to a considerable extent on back color or arrangement to draw attention to his displays.

CALENDAR OF APPROPRIATE SEASONABLE DISPLAYS

January In northern latitudes January is a month of snow, ice and low temperature, therefore, snowy landscapes, white leaves, etc., should be used. The seasonable colors are white, red, black, blue and shades of green.

"New Year" gives an opportunity to make a display featuring "resolutions," "turning over a new leaf," etc.

..., and the holidays, ..., and Saint Valentine's ... white and blue should be ... silver and gold are the best ... Valentine's Day ...

... season of snow, sleet, severe wind storms and ... It is the between-season time and it is advisable to ... colors suggestive of spring with displays. St. Patrick's Day green may be featured preceding March 17th.

April April is generally the month in which Easter falls. The Easter lily, rabbits and chicks are used. Violet, purple, white, cream and silver are seasonable colors.

May May is moving and house-cleaning month. Decoration Day falls on May 30th. For this the patriotic colors, red, white and blue, and gold and silver can be used.

June June is the bridal month and the month of roses. This also is the first month of the summer season. Light summery effects should be used.

July July brings the "Glorious Fourth," and the eagle, American flags, shield, fire crackers, etc., should be used. Red, white and blue, gold and silver are the colors. Later in the month "keep cool" suggestions are used.

August and September August and September displays should have vacation features.

October In the late September and October, fall coloring and autumn leaves should be used. Brown, black, yellow, orange, red and green are autumn colors. Witches, black cats, bats, etc., are typical of Hallowe'en, October 31st.

November November is the Thanksgiving month and the turkey is the feature. Autumn colors are seasonable.

December Christmas gives many opportunities. Santa Claus heads, stars, bells, wreaths, poinsettias, laurel and mistletoe are all used at this time. Fireplaces, chimney, reindeer, snowy landscapes, icicles, etc., are seasonable symbols.

Color Harmony As the attractive appearance of a display will depend to some extent on the color, some knowledge of color harmony is essential in order that a display may have no jarring tones. People are attracted by color and it is well to make use of this fact and use color accessories, such as velour, artificial foliage, etc., to enhance the appearance of the devices themselves. Pure blue, pure red and pure yellow are the primary colors and are used as standards.

Color harmony is of two kinds, "harmony of analogy" and "harmony of contrast." Harmony of analogy consists of the harmony of related colors or tones of one color. Harmony of contrast consists of colors in no way related. Yellow and blue when combined make green. Therefore, anything blue or yellow will be in harmony when displayed on green. Purple is formed by combining red and blue, so either of these colors will harmonize with a background of purple. White or black go well with any color, but together form a very effective contrast. Never use more than three colors in one display. White placed next to a color heightens or intensifies the tone of that color, black weakens the color used next to it.

Red and yellow are warm colors and should be avoided in summer weather, while blue, green, lavender and white have a cool appearance, and can be used extensively.

Advancing or luminous colors are those which contain considerable red or yellow, receding or sombre colors contain mostly blue.

Black should be used with luminous colors as:

orange	black	red	yellow	black	violet
yellow	black	orange	green	black	yellow
yellow	black	red	orange	black	green

White is preferable when associated with a luminous and a sombre color as:

red	white	blue	orange	white	violet
yellow	white	blue	green	white	blue
orange	white	blue	green	white	violet
red	white	violet	yellow	white	violet

Nickel appliances appear better when shown against something dark, as the contrast makes them stand out prominently. Copper appliances look best when shown on dark red, blue, green or purple. Appliances which are provided in boxes, cartons, wrappers, etc., should be shown against a background which harmonizes with the prevailing color of the cover.

Show-cards Every display should have at least one show-card with descriptive matter. A display without such a card does not carry a message. In most displays several cards should be used, telling of the convenience and benefit gained by the use of electrical appliances. The devices can be understood when descriptive cards are used; their labor-saving and comfort-giving properties can be made apparent to people. Show-card writing is not difficult to learn. It is necessary to have a set of good brushes, which should be taken care of after using by dipping them in water. All ink should be drawn from the bristles and the brushes cleaned thoroughly, flattened to chisel shape and left to dry in that position. The best brushes for show-card purposes are "red sable" chisel edge, in sizes 6, 8, 10 and 12, making strokes $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$ and $\frac{5}{16}$ inch wide, respectively.

Prepared show-card inks can be obtained from stationery stores. These are water colors because their excellent flowing qualities are preferred to oils or opaque paint. White six or eight-ply bristol board coated on one side comes in full sheets 22 by 28 inches and can be cut in standard sizes $\frac{1}{2}$ sheet (22 in. by 14 in.), $\frac{1}{4}$ sheet (11 in. by 14 in.) and $\frac{1}{8}$ sheet (7 in. by 11 in.).

Anyone can master the art of lettering by practice. For small cards, pen lettering is in vogue. The pens used are known as "Soennecken," and range in size from Nos. 1 to 6. No. 1 makes a stroke $\frac{1}{16}$ of an inch wide.

Price Tickets One of the first questions that enters the customer's mind is "How Much?" Because of this, price tickets should be used on appliances in the show-window. A woman is naturally timid in asking questions on appliances she knows little about, and she will not go into the store to inquire; whereas by seeing the appliance, the descriptive matter on the cards and the price, she gets it all, and if she is interested and cannot afford to purchase at once, she will save her money until she can. It is therefore well to show prices on appliances, except in the case of large or expensive specialties where it is necessary to "demonstrate."

SELLING FORCE

Basis of Company Selling

Intrinsically, the sale of electrical merchandise is the same wherever conducted. However, there are a number of conditions that apply to the merchandising of electrical appliances by a central station to its customers, in which it differs from the same function when performed by the contractor, dealer or any other exclusive retail merchandiser. And if taken advantage of, these differences can be made to fortify the position of the central station as a merchandiser.

Confidence is the basis on which all trade is built, and where a company has used its opportunity to establish a feeling of confidence in its relationship with the public which it serves this can now be capitalized in the merchandising effort.

The prospective purchaser must have confidence in the company and in its public statements regarding its merchandise; he must have confidence in the salesman, who is the contact point, and must believe what he says regarding the merchandise.

On the other hand, the company must have confidence—first of all, confidence in the merchandise which it proposes to sell; then confidence in its selling plan and methods; then confidence in the sales force to which this important work is intrusted.

In other words, selling must begin with the management of the company and must permeate every fibre of the organization. Whether this organization be simple, or whether on account of the size of the community and the contemplated merchandising effort, it is necessary to build up a large sales organization—in every case the entire organization must be enthusiastically behind the plan, and as a basis of that it is essential that the plan embrace the following fundamentals:

> Merchandise to which the company will attach its company guarantee—
>
> Merchandise which is sold at a fair, interesting price to the customer.

Attitude of the Company Toward the Customer as Indicated by the Selling Force

Sincerity on the part of the company is the first step, without which there can be no continued success in any sales effort.

The idea that electricity will sell itself, requiring no skilled sales organization, has been exploded by the knowledge gained from experience in recent years that electrical appliances will not sell themselves. The sale of electrical appliances is followed by the sale of more electricity. In selling appliances, we must adopt the successful merchandising methods of the first-class department store and we cannot over-emphasize the importance of prompt and satisfactory service. When we investigate up-to-date merchandising methods, we soon begin to wonder why our methods are so slow and inadequate. This leads to self-analysis, and the value of introspection lies in the elimination of faults and the development of those positive qualifications on which success is founded.

Selling Force

The great trouble with us, both in individual salesmanship and in the training of salespeople, is that we have very little method in our work.

This "method" should begin by formulating a definite sales plan which can be crystallized into the shape of rules for the guidance of the sales force. These rules should be elemental in character, not too numerous, and so simply handled that a young man or young woman with little selling experience can begin to operate with reasonable efficiency at once. Wherever the organization is large enough, the sales force should be under the direction of an experienced merchandiser who should thoroughly train the force in all of the arts of retail selling.

Qualifications

It is the consensus of opinion in your Committee that the sales force should be made up of men and women who have the following basic qualifications:

They should have gone through the public school, including high school, and before beginning to sell should have the opportunity of learning the practical operating facts about the electrical merchandise that they will handle.

The men should be taken on between the ages of 18 and 25 and women between the ages of 22 and 25. They should speak English well and fluently. Cleanliness and neatness are absolutely essential, and courtesy and cheerfulness in dealing with customers should be constantly suggested. The attitude of our salespeople toward existing as well as prospective customers should be so satisfactory that after the completion of one transaction that customer will experience a feeling of pleasure in going back to place another order with the same salesperson. In other words, our sales idea should be that the customer is the boss. We should all recognize the value of a satisfied customer as the biggest asset our companies can have.

Education and Training of Salespeople

The education of our salespeople in the business routine of other departments of the company must of necessity be slow, but the process should be continuous. A clear understanding of the company's policy toward the public is important as a preliminary to active sales effort.

Regular meetings for the instruction of salespeople in the electrical and mechanical construction of the merchandise to be sold should be conducted by the heads of the sub-departments, who are closely in touch with the salespeople individually. The most important part about these meetings is that they should be frequent and the program for any given season should have the virtue of continuity. In order to teach the salespeople how to apply the various devices on sale, it is necessary to have demonstrations in suitable settings placed in the merchandise stores. Then the demonstrator, with his or her special training, can teach the others in detail the correct application of the devices. This training should, of course, be continuous, as the different devices are advertised or pushed from week to week, or month to month.

A plan that has proved successful is outlined as follows: Actual sales demonstrations are held at least once in two weeks. A few days before the demonstration is to be held the commercial manager posts on the bulletin board, or gives verbally, the sales problem for the coming demonstration, such as "Sale of Electric Flat-iron to a Housewife at Her Home." At the time the problem is given out, notice is not given to any individual salesman that he is to make the demonstration. In this way the interest of each salesman is aroused and they all make a study of the problem. At the time of the actual demonstration some one salesman is picked out to make the demonstration, and he carries it out to the best of his ability, as nearly as possible as it would actually occur. The commercial manager himself may act as the buyer; still better, an outside person, unknown to any of the salesmen.

Before the demonstration is made, the commercial manager should prepare a written examination paper, containing a few questions which should cover the general points of a succesful demonstration. At the end of the demonstration this examination paper should be passed around to all the members of the commercial department, except the demonstrator, and the questions answered by them. The purpose is to bring out the individual criticisms of each man. If there are a large number of salesmen, those who are the first to criticize the demonstration can generally cover the subject pretty thoroughly and the salesmen who are called upon later can simply say that they agree with the previous criticism. The examination paper answered by each salesman brings out his own personal opinions.

The commercial manager then goes over the different questions and answers, and if the individual salesmen fail to criticize the demonstration properly, they should be held fully as much to blame as the man making the demonstration. At the end of this time the commercial manager himself can make such criticisms as are necessary.

Seasonable appliance campaigns require extra canvassers as a rule, although we shall probably get our business regulated to the point where the campaigns will follow one another so closely that the same force can be retained throughout the year.

Selling the Advertising

It goes without saying that no sales campaign can be successfully conducted without advertising through the well-recognized local channels.

It should equally be a matter of course that the selling force cannot function properly unless it is fully conversant with the advertising effort.

The day-by-day work by the salespeople must be closely coordinated with the day-by-day advertising announcements to the public.

In order that the sales force shall properly appreciate the important part that the advertising bears in the total results, a definite plan should be worked out for their instruction along these lines. Moreover, by the proper sort of cooperation between the advertising department and the sales force, sales suggestions will be contributed by the selling force which will be of great value to the advertising end of the organization.

Method of Paying Representatives

Outside salespeople should be men: women should be employed generally in the stores and shops. More efficient service can oftentimes be obtained from a properly trained saleswoman at $12 per week than from a young man at $15 per week.

Where special selling campaigns are put on, it has often been found advantageous to employ part of the time of certain people, as for instance high-school students who are able to take up the work at one or two o'clock, and put in the heart of the day, or domestic science teachers who are able to give an hour or so a day for demonstration in the salesroom, or college men and women who are able to devote time to this work in the vacation period. The idea of evening sales work has been worked out very satisfactorily in some communities, either through house-to-house canvassing or through telephone appointments to visit salesrooms.

We have referred to sincerity on the part of the company and its sales organization as a basic necessity in any sales campaign; that is because only through sincere effort can we gain the confidence of the public, and now the question before the management is how to keep salesmen sincerely confident in the company and in themselves. We, then, come directly to the question of methods of paying our sales organization. In this we can learn from the successful mercantile houses, (1) that the salesman should be paid enough on a straight salary basis to enable him to live comfortably, which amount depends upon living conditions in the city or town in which he is employed; and (2) that in addition to the salary there should be a commission or bonus plan, dependent upon the gross profit in the line of goods for sale; and the importance of the value to the lighting company of the appliances as revenue producers should not be overemphasized.

If we take a given line of electrical merchandise that we intend to sell, decide on an average gross profit to cover the cost of doing business (which includes the cost of selling), and to provide a fair net profit, we can then determine what percentage of the selling value of the goods should be allowed for sales expense. The average cost of doing business in the ordinary retail mercantile establishment is understood to range from

27 per cent to 30 per cent. The average allowance for sales expense is 10 per cent. Of this 2 per cent may be set aside for supervision of the sales organization and 8 per cent paid to the salesmen in salaries and commissions. The approximate figure of 10 per cent for selling expense would apply to the outside salespeople only. As for the inside sales people, there must be an allowance taken out of the percentage for rental and up-keep of the store.

Now in the case of outside salesmen, what part of the 8 per cent should be flat salary and what part should be commission or bonus? Here is where the importance of the volume of sales at the selling value comes in. If the class of merchandise to be sold is such that a great deal of work must be done to create a demand before actual sales can be closed, it will probably be found that even though the entire 8 per cent of the selling price be devoted to flat salary, the salary will still be inadequate; on the other hand, if the class of merchandise is easily sold in large volume, the flat salary should constitute the greater part of the percentage allowance, leaving a nominal percentage only for commissions. In this latter case, the percentage allowance for flat salary would have to be based on an average of the expected volume of sales. As an example, if it were expected that a salesman would sell an average of $1,500 worth of merchandise per month, 7 per cent would be a fair basis for salary and 1 per cent for commission; or 6 per cent for salary and 2 per cent for commission.

The value of the merchandise to the lighting company in producing revenue may affect the commission, although this entails an elaborate point system, which, because of its expense, should be discouraged or eliminated if possible. It would be better to guide the efforts of the salespeople through proper supervision, and, generally speaking, the seasonable character of the goods will take care of this question to a large extent. As an illustration: Fan motors are sold more easily in the summer than in winter months. Radiators, on the other hand, are sold more easily in the winter than in the summer months, and it would be foolish to attempt to sell radiators in a season when there is no natural demand for them. The question of selling merchandise to suit the customer's needs also affects this point, and there should be no encouragement given to salesmen to sell a 6-pound flat-iron to a customer who wants a tailor's iron; or, a better illustration, it would be unwise to sell a 1500-watt radiator where a 500-watt radiator would amply fill the customer's needs.

In developing new business, the Merchandising Department is the most important contributory factor. So true is this, that the two departments must be most closely associated, and your Committee recommends that the Merchandising Department be placed under the supervision of the Superintendent of New Business so that encouragement will be given to the regular lighting and power salesmen to study the customer's needs on his premises, and through the sale of efficient apparatus and equipment insure the greater use of electricity. One of the large progressive lighting companies has gone so far in this direction as to appoint a Superintendent of New Business and Merchandising with all of the lighting and appliance salesmen and all central and branch-store managers reporting directly to him. In this the large company will very closely resemble the small company where the New Business Manager must of necessity have charge of all sales.

The problems of selling in the small central stations are fundamentally the same as in the large central station. But, of course, the machinery for carrying on business is altogether different.

In this report it has been our effort to suggest some of the fundamental ideas and refer to some of the larger plans. The smaller central station should be able to modify these plans to meet the growing requirements.

REPORT OF SUB-COMMITTEE ON STYLE MERCHANDISE

Electrical merchandise may be divided into three classes. The first includes the staples, such as incandescent lamps, plugs and numerous other items. In the second class are the labor-saving devices, most prominent of which are the washing machine, vacuum cleaner, ironing machine, fireless cooker and the like. And in the third class we would place portable lamps, fixtures, artistic loving-cup urns and other electrical articles that have received the attention of the artist designer as well as of the heating engineer. This last group we call Style Merchandise and it is the subject of our particular study in this brief report.

The retailer of electrical devices is confronted with certain handicaps in the sale of his merchandise and is at a distinct disadvantage to the merchant in other lines because of the very nature of his product. There is constant demand for the staples as necessities, but before labor-saving devices can be sold, the idea of the use of the devices must be sold. This group constitutes an important part of the sales of any electrical retailer. He is, therefore, confronted with the important problem of how to bring the people to his shop.

The central station merchant has an advantage in having prospective purchasers coming to the store on other missions than shopping; that is, electric service customers coming to pay bills, to make application for service, or to consult representatives on some matter in connection with their service supply; but, nevertheless he is confronted with the important problem of obtaining favorable attention to his merchandise before his selling force can change passive prospects into active buyers. Style Merchandise will aid in solving this very problem.

Another value in Style Merchandise lies in its power to draw people to the store because of its inherent shopping appeal. It may be a novelty attraction, or an appeal to the instinct of beauty which every human being possesses. This merchandise gives the purchasers an opportunity to express their individuality.

In addition to this shopping appeal, Style Merchandise has other practical values in the showroom of the central station, because it increases the number of items which can be sold at a profit, and at the same time beautifies the store and gives it shopping personality.

We find the practical problems in handling this class of merchandise are Buying, Proper Pricing, Attractive Displays and Advertising.

Buying: The central station merchant must buy goods for which the public will shop. This involves an analysis of the local buying public, which is usually made up of a combination of ultras, middle class, and the cheaper trade. Each central station merchandising man must analyze his public and select such an assortment of Style Merchandise as will appeal to the greatest number of his prospective purchasers, remembering always that the great number of buyers are striving to follow what is acceptable to the ultra trade. We recommend that the merchandising man be prepared to get in touch with the source of supply for the different classes of style goods. Practical merchandising suggestions can be had from the manufacturers. We believe also that the merchandising men should prevail on some of the manufacturers to improve their styles. The percolator, toaster, chafing-dish, portable lamp, candle holder or fixture can be made in designs of unusual attraction to appeal to women purchasers.

Pricing: If goods are well bought the question of pricing is simple. As a rule, the mark-up on portable lamps is 100 per cent on cost and 50 per cent on selling price, and it is customary when making special offers to have a mark-up of 50 per cent on cost and 33⅓ per cent on selling price. If it is found that a certain item of Style Merchandise does not move, it is considered standard practice for the merchandising man to reduce his price materially and move the stock. Successful merchandising involves the question of turn-over, and this requires that when a loss must be taken, it be taken immediately—the necessary sacrifice in price being made to move the goods.

Displays: In displaying portable lamps and other style numbers, each piece should be arranged so as to express its own individuality. When displaying portable lamps, it has been found that an olive green velour makes a good covering for tables and it is likewise a good material for background effects. In window display work one beautiful number properly staged with the right background will attract more attention and bring more buyers into the store than a miscellaneous assortment of Style Merchandise. In window display work it is a good plan to show numbers which make an ultra appeal, as the big middle group of buyers will be attracted by this class of display and will come into the store to see what can be found with the same style appeal at a price which will fit their pocket-books. It is a good plan to group Style Merchandise on a price basis, and to keep the higher priced merchandise separated from the lower priced. The cheaper merchandise is never raised to the level of the higher priced goods by being shown in combination.

Advertising: Style Merchandise, particularly portable lamps, should be advertised throughout the year, with emphasis during the Christmas holidays. The effect desired from advertising is to carry the showroom display to the reader of the advertisement, for by this method the general effect of the store is multiplied.

As a final thought on our subject we quote a remark made by a high official of one of the largest chain store organizations in the country, who said, "Successful merchandising is based on good-will, and the chain store uses every means it can devise to create and develop it." In our opinion, a line of Style Merchandise should be introduced by every central station merchandising department for its value as one means of developing good-will, because the attractiveness of Style Merchandise to shoppers is an invitation to the store.

Respectfully submitted,

C E Greenwood, *Chairman*
Henry Harris
H A Lewis
F D Pembleton
D R Smith
M Schwarz
W S Wallace

REPORT OF SUB-COMMITTEE ON TRADE DISCOUNT AND MARGIN OF PROFIT

Your Committee on "Trade Discount and Margin of Profit" has made an attempt to cover this subject, which has been discussed very extensively in every line of merchandise.

From time to time attention has been called to our method of doing business, as to why electrical merchandising departments show a loss. Are you willing as the merchandise man to admit that the electrical merchandising business is not profitable, or are you going to do what other merchants do, examine your costs closely and your selling price and see how the gross profit looks, and when you see that the gross is low, will you say "How can it be increased?" The answer in your Committee's opinion is that it can be solved only by the merchandise man and manufacturer getting together, instead of working separately and at cross purposes, because the merchandising man has not paid enough attention to his discount, and also the manufacturer feels he is allowing a substantial discount from the face of the invoice to justify a proper margin of gross profit to the retailer, when the manufacturer does not know what the proper per cent of gross profit should be.

The per cent of gross profit of a merchandising department should be based on selling price and not on cost price, similar to the department-store method. Who would think of opening a large store and arriving at the gross profit from the total purchases of the store? If anyone did, how could he arrive at a selling price of store merchandise? This would be impossible, as some articles would be high and others low. The method of the department store is that certain lines of goods are classified into departments. These departments in large stores run as high as one hundred or more and each department figures its own gross profit. This, we will assume, is the proper method, owing to the successful operation of department stores. As we feel that this method is correct, why not follow their plan and subdivide our electrical merchandising stock into the following classes:

Department No. 1—Washing Machines
" " 2—Table Appliances
" " 3—Labor-saving Kitchen Devices
" " 4—Vacuum Cleaners
" " 5—Table and Floor Lamps
" " 6—Incandescent Lamps
etc.

To do this would require very little additional accounting, and if this were done it would be of great assistance and a tremendous step forward towards solving the problem of the proper margin of gross profit that the electrical merchandising man has to have to enable him to show a net profit. It would be of the greatest assistance in talking to the manufacturer of any particular line to prove our claim that his discounts from list are not large enough and that his particular line of goods is not being carried as a profitable business but at a loss. The manufacturers are large enough to realize that if their articles cannot be handled profitably they cannot expect to dispose of goods, and therefore of their own good graces readjust their list prices and their discounts so as to justify the electrical merchandising man handling their goods as one of the profitable merchandising departments of his store. This will place the electrical merchandise man in a similar position to a department-store manager who immediately states that he must have at least 33⅓ per cent or 40 per cent on selling price to carry a line successfully.

To state definitely what margin of profit must be obtained on electrical merchandise is impossible for your Commitee, but it feels that it should be no less than 40 per cent on selling price as a gross profit, assuming the cost of doing business to be approximately 30 per cent of the selling price. This may not be enough for a line of goods that will require much educational and constructive work to create the desire for the purchase before a sale is made.

To give the electrical merchandising man an idea of what per cent of gross profit is required for necessary articles, with a large stock turnover, the following extract from "Gross Profit Ratios—Percentages Required by a Big Eastern Store in Addition to Discounts, Etc.," printed by "The Dry Goods Economist," is submitted, showing six of a list of forty-three departments and the per cent of profit each department was expected to give:

	Per Cent on Selling Price	*Per Cent on Bill Price*
Blankets and Comfortables......	30	42 6/7
Candy	35	53 7/8
Clothing & Hats (Men's & Boys')	33 1/3	50
Furniture & Bedding...........	33 1/3	50
Groceries	20	25
Housefurnishings	33 1/3	50

"When an article is to be sold at a gross profit equivalent to 25 per cent on its selling price, it is necessary to mark that article at a price which is not less than 33⅓ per cent above its cost price—because a gross profit which is equivalent to 33⅓ per cent of an article's cost price is at the same time equivalent to only 25 per cent on that article's selling price."

The matter of turnover of stock is, of course, a big factor in maintaining a stipulated gross, but we feel from the experience of other stores that 40 per cent may be the correct figure, although possibly it is too low.

Your Committee is very anxious to impress upon its members the desirability of classifying their lines of merchandise. It would be so easy if we could take before a committee composed of manufacturers the gross profit figures of half a dozen or more central stations on their particular lines of goods, and show definitely what the returns were to the retailer by following the list prices which the manufacturer established.

Respectfully submitted,

DORSEY R SMITH, *Chairman*
C E GREENWOOD
J F KILLEEN
A G KIMBALL

REPORT OF SUB-COMMITTEE ON MERCHANDIZING TUNGSTEN AND TABLE LAMPS

MERCHANDISING INCANDESCENT LAMPS

Your Committee recommends that the following report be supplementary to the Lamp Report of 1919 and therefore has taken up the question of incandescent lamps from the merchandising standpoint only.

The old basis upon which the central stations endeavored to guarantee good service to their customers by giving away lamps was made necessary by the unsatisfactory quality of a number of lamps of doubtful manufacture, which when installed would affect the service given to the consumers by the central stations. The carbon and gem lamps burn below a safe candle-power and this made it necessary for the central stations at that time to have a system that would insure these old lamps being taken off their lines. The lamps would blacken and burn for a long period before burning out, resulting in serious complaints. The central stations also were desirous of keeping their lamp sockets filled, and in order to give good service, it was found necessary actually to control the lamp situation either by cutting prices or on a free renewal basis.

This situation has changed considerably by the introduction of the tungsten lamps, which are recognized now as a standard, and over 90 per cent of the lamps manufactured by the large lamp companies are of the tungsten type. Lamp manufacturers publicly advertise that tungsten lamps are the best that can be produced in lamp manufacture. These lamps automatically burn out when they reach a long life, which relieves the danger of consumers trying to burn them below their normal candle-power. Tungsten lamps last only a certain number of hours, so why should not central stations get the legitimate profit by having their customers come in and purchase these lamps, which insures a profit.

Several reasons why central stations should merchandise tungsten lamps are that they are advertised nationally and locally and are becoming exceptionally well known to the buying public. They are absolutely on a well-established basis as to quality, which insures a certain profit to the central stations, instead of expense as heretofore, where lamps were sold at or below cost or given free. This is a vital point to be remembered with the increased cost of producing current and the increased cost of central station operation. Tungsten lamps offer from a merchandising standpoint as to profit one which is extremely attractive. The lamps are placed at the disposal of the central station on a consigned basis and the lamp manufacturer even goes so far as to allow a certain percentage to the merchandise department for bookkeeping and record keeping, provided the reports are submitted by a given date each month. This is in addition to a sliding scale of discounts from 10 per cent to 38 per cent off of list, based upon the quantity of lamps purchased. This basis of buying strongly offers wide inducements to a merchandising man to increase his sales on a nationally advertised article that has a stipulated resale price everywhere.

For a sales getter in other lines of merchandise, tungsten lamps offer opportunities. A customer buys a lamp, and because it is necessary he is willing to pay list price for it just as though he were buying some other stipulated article. This brings him into the store and offers an opportunity for the sale of a washing machine, a vacuum cleaner, a table lamp, etc., which are on display.

From an outside sales standpoint the sale of tungsten lamps at list price offers an opening whereby your salesmen can gain admission into the homes to give them an opportunity to sell not only lamps and shades, but an excellent opportunity for the sale of vacuum cleaners, washing machines and other electrical appliances.

Central stations in merchandising lamps are merely keeping pace with intelligent and modern business methods whereby goods are sold at regular prices and for a profit where definite service and value are rendered in return, it being only a question of good merchandising methods whether or not a central station controls the lamp situation, giving service such as prompt deliveries, intelligent suggestions as to proper sizes of lamps to be used, etc.

This will place the central stations in a stronger position than if they give away something, which always has with the public an element of mystery and suspicion of "How can it be done?"

MERCHANDISING TABLE AND FLOOR LAMPS

The sale of table lamps offers to the central station Merchandise Department one of the greatest assets it could obtain, owing to the fact that the styles and designs and color values change from season to season. The problem is always before us what to use to attract the ladies and get them to come into the electric store. This line of merchandise not only offers the element of decorative and attractive value but the large return in gross profit which we are all desirous of obtaining.

A well-selected line of table lamps, floor lamps, and silk shades will insure a large number of people visiting your shop provided you display the line artistically. You will not sell one to a customer and guarantee it for life and never hear from that customer except through a complaint, but it has the virtue of bringing him back to your shop, as table and floor lamps are always being bought—a customer will buy a reading lamp and he will call again for a floor lamp for the music room or a floor lamp to be placed beside a large armchair usually found in the living room, or for a floor lamp to be used at the bridge table. If the display of a pretty boudoir lamp is attractive to the lady, this naturally suggests a bed lamp, so you can see it is the only article we have from a decorative standpoint and the only one which permits of a number being sold in the home. The customer will constantly seek your shop to see what you are showing.

Central stations having a Merchandise Department should consider the table and floor lamp division of prime importance as it is in a position to render to the customers invaluable assistance in their purchases. With this possibility the prospective buyer will get better attention by patronizing the central stations, which thereby gain closer relationship and good will of the public, as each customer purchasing table lamps, etc., will have before him at all times something to remind him of the central station.

Nothing adds to the home as much as a well-placed lamp, whether it be a decorative floor lamp, or one of a table variety, and it calls forth admiration from visitors, which fact gives the central station free advertising. Perhaps no other electrical merchandise is so constantly before the customer as one of the many styles of portable or reading lamps.

The table and floor lamp possibilities from a central station sales standpoint have been brought to such a point that manufacturers have become keenly alive to the fact that central stations are the logical channel through which to distribute their products. One of the largest lamp manufacturing companies has been so impressed that it has gone to great expense in making up a line of lamps, after consulting as to styles and designs with merchandise men from some of the central stations handling its line. The possibilities of an enormous output of floor and table lamps properly manufactured and displayed led this company to this close cooperation between the central stations' merchandising men and the company.

The Committee feels that with the variety of lamps and shades that are now being offered by manufacturers of overlaid glass, various other types should be taken advantage of by the merchandise men of central stations and a well-selected assortment should be placed in their showrooms.

The most important part of this business is the fair returns that can be obtained from this class of goods—50 per cent or better on selling price. This means that the floor and table lamps have no service charges to be deducted from their gross profit, for if a lamp is delivered properly, the sale is complete.

Respectfully submitted,

DORSEY R SMITH, *Chairman*
R E FLOWER
W D LINDSEY
F D PEMBLETON
W S WALLACE

REPORT OF SUB-COMMITTEE ON STANDARDIZATION OF CORDS AND PLUGS

The most valuable aid has been given to the Merchandising Committee by the Wiring Committee in its earnest and thorough deliberations on the subject of standardization of cords and plugs, and an unnecessary duplication of effort has been avoided by your Sub-Committee incorporating in its report the findings of the Wiring Committee on this subject. With the consent of its Chairman we have made some direct quotations from sections of the Wiring Report.

Standardized Cord

The size of cord for use with electric appliances cannot well be standardized even if such action were advisable. We would recommend only that care should be taken in the selection of a liberal minimum of carrying capacity for the work to be done.

As for quality of cord for use with electric appliances, we quote from the Wiring Committee Report:

"The Committee feels that the cords to be used by our customers should exceed a minimum standard of quality as respects tensile and dielectric strength under actual conditions of use, and that the use of cords not reaching this standard should be discouraged and forbidden if possible. The Committee feels, however, that the determination of the standard will not be arrived at by discussion around the Committee table, but that it should be worked out by field experience under the observation of inspectors and central station men.

"The quality of the connection between the cord and its plugs at either end is, of course, of equal importance with the quality of the cord itself."

Standardization of the Socket Plug

"This matter is now involved in litigation, for which reason the Committee feels that a detailed report thereon should be postponed."

In connection with the subject of the socket plug, we would suggest the installation of either double T or four-door receptacles, thereby creating greater flexibility in service by making possible the use of the majority of the types of plugs now on the market.

The question has been raised as to whether attachment and appliance plugs should be polarized.

While polarization might be, in fact would be, desirable in the case of some very special appliances, especially if of high voltage, yet to require polarization at the present time on the ordinary plug would seriously interfere with millions of dollars' worth of apparatus which is now in safe and convenient use.

Standardization of the Appliance Plug

This problem is a difficult one to handle because each manufacturer is vitally interested in his own product, and rightfully so, and if the cord is at fault, the appliance itself may be considered of poor quality. It is, therefore, important that the complete article as placed on the market shall satisfy the manufacturer. The manufacturer may feel also that it is not to his benefit to make a universal plug, and that he has a right to have his plug marketed in preference to another.

A further subject for consideration is the desirability of having a standard appliance plug, by reason of the variation in classes of electric appliances and their use. Heavy duty and light duty appliances may present different problems, as will also small motor-driven devices or portable lamps. It appears, therefore, that standardization of the plug on the appliance end of the cord must proceed only after careful thought and deliberation by the several parties interested.

"The actual progress that has been made is due to the consolidation of three of the large manufacturers who, as a result of consolidation, have adopted standard prongs and standard housings on their appliances, these being arranged to take interchangeable plugs.

"These particular prongs and housings will also take other plugs which have been designed for use either on flat prongs or round prongs, which may differ slightly in dimensions and distance apart.

"While the design of these other plugs appears theoretically as though it might have poor contacts with resulting loss in heating value, yet if it should give commercial satisfaction it will be a great help toward the practical standardization which will avoid the need of carrying several different designs of plugs."

Your Sub-Committee recommends that central station merchandising men have a standard extension cord made up for sale in both 6 and 10-foot lengths of quality cord, with a suitable attachment plug on one end, and on the other end one of the late-type appliance plugs designed for universal service. We believe that from this field experience useful information can be obtained; and the adaptability and durability of these complete cords can be ascertained readily from service given in the homes of customers. And in the event that they can be used successfully, we are assured of a long step being made in proving the distinct advantage to be gained by complete standardization of the appliance cord and plug.

Respectfully submitted,

C E Greenwood, *Chairman*
O R Hogue
W S Wallace

REPORT OF SUB-COMMITTEE TO COOPERATE WITH THE COMMITTEE ON COORDINATE ADVERTISING AND SALES CAMPAIGNS

In the early part of the administrative year, beginning July 1st, 1916, the Commercial Section's Executive Committee authorized Chairman E. A. Edkins to appoint a new Committee to be known as the Committee on Coordinate Advertising and Sales Campaigns, the object of such Committee being "to formulate plans whereby the advertising of manufacturers and the monthly sales campaigns of central stations and other distributors of electrical appliances may be tied together," in other words, the coordination of merchandising effort in the electrical industry so that by means of synchronized, systematic effort all concerned could derive the maximum results possible.

The Committee on Coordinate Advertising and Sales Campaigns presented in its 1917 Convention Report a detailed outline of the plan proposed and suggestive ways and means which could be employed successfully to the end desired. In this Report two monthly schedules were suggested, one treating with the merchandising of electrical appliances, the other with various lighting applications.

Merchandising Schedule

As a result of experience during the last couple of years, the Committee, in its 1919 Convention Report, will recommend some slight modifications in the "Merchandising Schedule" as originally set forth in its 1917 Report. The 1919 "Merchandising Schedule" proposed will be as follows:

January—Clearance Sale.
February—Heating Pads.
March—Vacuum Cleaners.
April—Sewing Machines and Sewing Machine Motors.
May—Grill.
June—Irons.
July—Fans.
August—Clearance Sale.
September—Washing Machines.
October—Radiant Heaters.
November—Toasters.
December—Electrical Christmas Gifts.

Lighting Schedule

No changes in the "Lighting Schedule," originally appearing in the 1917 Report, will be made in the 1919 Report. An outline of this monthly campaign follows:

January—Better Lighting.
February—Outdoor Lighting (tennis courts, playgrounds, etc.).
March—Stores and Windows.
April—Residence.

May—Electrical Advertising (signs, outline lighting, display lighting, etc.).

June—Public Buildings.

July—Industrial.

August—Stores and Windows.

September—Electrical Advertising (signs, outline lighting, display lighting, etc.).

October—Residence.

November—Better Lighting (with emphasis on office buildings).

December—Industrial.

Reports coming to the attention of the Committee on Coordinate Advertising and Sales Campaigns during the year 1919 would seem to indicate that the schedules, and particularly the Merchandising Schedule as recommended in 1917, have met with considerable favor and have been adopted to considerable extent by central stations and manufacturers. The Committee, encouraged by results achieved during the war period when merchandising activities were, comparatively speaking, conspicuous by inactivity, is planning to launch an intensive campaign in an effort to have the Merchandising and Lighting Schedules adopted widely during the coming administrative year. Details may readily be ascertained by referring to the 1919 Convention Report of the Committee on Coordinate Advertising and Sales Campaigns presented at the Atlantic City Convention.

Respectfully submitted,

HENRY HARRIS, *Chairman*
A G KIMBALL

REPORT OF SUB-COMMITTEE ON HELP TO SMALL CENTRAL STATIONS

The Sub-Committee appointed to consider the subject of help to small central stations feels that a broad, general handling of this subject would call for careful investigation as to—

What help the small central stations require,

What they are entitled to expect from the Merchandising Committee.

Manifestly, the time is too short to make such a detailed investigation. However, the Committee makes the following suggestions:

First: It should be possible to secure a fuller coordination between the promotion and sales work done by the various manufacturers and jobbers to the manifest advantage of the small central station.

By this means it should be possible to adapt more closely to the purposes of the small central station the various advertising and sales helps offered, both in preparation and distribution.

We therefore recommend that the Merchandising Committee make an effort to accomplish this result.

Second: We believe that the work and the reports of the Merchandising Committee would be of benefit to the small central station and that some means should be found for calling them to its attention.

Third: We suggest that the Merchandising Committee take advantage of the work of the Merchandising Committee of the Geographic Sections by making the chairmen of those Sectional committees automatically members of the Merchandising Committee of the N.E.L.A.

Fourth: We suggest that it is important that every member of the Merchandising Committee consider it his personal duty to bring the work of this Committtee to the attention of small companies whenever opportunity offers.

Let the members of the Merchandising Committee consider themselves a sales force to sell the work of this Committee to the small central station.

Respectfully submitted,

L H Mertz, *Chairman*
C A Flint

REPORT OF GOODWIN SUB-COMMITTEE

Your Committee has made an investigation of the Goodwin Plan as it applies to merchandising and in doing so employed the following methods:

1. A careful review of articles which have appeared in the trade papers during the past year and a half.

2. A careful review of editorials appearing in trade papers.
3. By personal attendance at meetings held throughout the country at which members of the committee were present; these meetings being addressed by Mr. Goodwin.
4. By having him appear personally before the Merchandising Committee and before the Executive Committee of the Commercial Section, and following his talk, answer questions relating to the plan.
5. By personal investigation in communities where the plan has been operated for periods of one year or more.
6. By a paper read before the New England Section of the N.E.L.A. and printed in the proceedings of the New England Section.

The Committee interprets the plan to be a broad campaign of education in which the various groups in the industry are being brought together

1. To cooperate in each local community to the end that the most cordial relations will be established between the different groups in the industry;
2. To the end that the most desirable methods be employed, based on local conditions, to place properly before the public the advantages of electricity as it relates to the use of household devices and similar products in the home, factory, etc.

The Committee has carefully investigated the effect that this plan would have upon the future activities of central stations in their merchandising field, and clearly understands that the plan does not in any way contemplate the central stations retiring from any activity in any branch of the industry in which they are now engaged, but the plan does contemplate that the policies of central stations in respect to their activities be so designed as to encourage others to become active in merchandise selling under the most modern business methods.

The Committee further understands that the plan recommends separate cost accounting for merchandising departments of its business to the end that these departments would be self-sustaining and employ approved accounting methods.

The Committee recommends that each central station company encourage its Commercial Manager or Manager of its Merchandising Department to interest himself actively to the end that the general ideas incorporated in the plan as relating to merchandising be made effective. This result can be best accomplished by the merchandise man of the central station in each community becoming a member of a local organization if there is one in existence at the present time, or by organizing one and being an active member. In this way all local electric men can be brought together by holding meetings and can accomplish better results. The local electric men would be advised as to the class of electric appliances which the central stations preferred to go on their lines. Giving this experience of the central station man to the local electric people will bring about the cooperation which is mentioned in this paper. By so doing the central station will tend to encourage the highest grade of appliances and devices for general use on an improved distribution basis, with a general tendency to increase the standard and volume of electrical work.

Your Committee has confined its investigations to that part of the plan relating to merchandising and recommends that the Public Policy or Executive Committee of the Association appoint similar committees to make further study and report on the complete plan. The Committee has evidence that the plan has resulted in a material increase in business both in merchandising sales and energy consumed, as well as being a general uplift movement for the benefit of the whole industry.

In conclusion, the Committee wishes to state that in numerous cases investigated where central station representatives were in opposition to the plan, it was clearly demonstrated that misunderstandings had developed as to what the plan contemplated, and to this end the Committee urges that sub-committees be appointed from the Executive Committee and Public Policy Committee to make investigation of the complete plan so that these misunderstandings may be removed and the benefits accruing to the central station may be realized at the earliest possible date.

Your Committee feels that this plan in no way conflicts with the work of the Society for Electrical Development but on the other hand can and will be of material assistance to that Society in its work.

The Committee has talked with Mr. Goodwin and it finds, as far as he is concerned, that it is immaterial whether the plan is called the "Goodwin Plan" or by some other term, so long as it will bring about the conditions as outlined in this report, and he has so stated a number of times in his public addresses.

Respectfully submitted,

DORSEY R SMITH, *Chairman*
F M FEIKER
C E GREENWOOD
R E FLOWER
L H MERTZ

Respectfully submitted,

E R DAVENPORT, *Chairman*

Representing Central Stations

L C CASS
J E DAVIDSON
C F FARLEY
C E GREENWOOD
HENRY HARRIS
O R HOGUE
C E MICHEL
F D PEMBLETON
DORSEY R SMITH
WILLIAM S WALLACE

Representing Manufacturers

F M FEIKER
CLYDE A FLINT
R E FLOWER
J F KILLEEN
A G KIMBALL
H A LEWIS
L H MERTZ
M C MORROW
M SCHWARZ
W S TEMPLIN
J M WAKEMAN

THE CHAIRMAN: The report of the Committee on Merchandising is before you for discussion.

JOSEPH F. BECKER, New York City: Just to open the discussion, I will say that the report as read indicates that you have an encyclopedia on merchandising practice for your guidance during the coming year. It is hardly necessary for me to rehearse the statements made by Mr. Marshall in presenting the report, or to go into the details of the practice of the company I represent. I have simply one thought that I think is worth while to give you this afternoon—the manufacturers of electrical current consuming devices evidently see the light—they are putting forth their energy and efforts in inducing the use of current consuming devices. The evidence I refer to is the national advertising they are doing. The May 3rd issue of the *Saturday Evening Post* contained 17 pages of electrical advertising, and the issue of the week following contained 11 pages, one manufacturer each week spending through that medium thousands and hundreds of thousands of dollars.

From the pamphlets you receive you all know the immense efforts they are making in this direction and the amount of work they are doing in connection therewith. The point is that if the manufacturers see this opportunity and realize the demand, why is it not opportune for the central stations to join in that advertising and tie in with it, and go out and get the business? (Applause.)

H. H. NEWMAN, Trenton, N. J.: There is one clause in the report relative to the necessity of campaigns. We still seem to be following along the lines of least resistance. It is stated in the report that there are certain times when it is advisable to institute these various campaigns. I believe we ought to take a leaf out of the merchandising practices of our drygoods merchants and have an advertising campaign on certain goods at the "off-peak." We all know that they sell their white goods in January and blankets in August, that is, they put forth a very special effort at these times to sell these goods. Why shouldn't we put our special efforts forth to sell our goods at the time when they are not moving rapidly? In other words, why should we make our iron campaign in June, when we would sell a large number of irons anyway, and let it go in the winter time, or why should we endeavor to sell certain articles in the Fall and Winter when they sell readily anyway at this time, and not try to push these articles in the summer time? I believe it would be for the best interests of the total year's sales to make our campaign sales at the "off peak," instead of at the time of the "peak." We may not sell as many of the articles in campaigns conducted at that time, but we would sell a greater total of these articles in the course of the year, if we followed that plan.

F. D. PEMBLETON, Newark, N. J.: Supplementing Mr. Becker's very pertinent remarks regarding advertising, I should like to point out to the central station men present that the other dealers, who, by the nature of their business have a right to enter the electrical appliance business, are not asleep. They are very much alive to the business possibilities that may be developed from the influence of the national advertising which is being done, and some of these dealers are already in a position to have a great advantage over the central stations in selling electrical appliances.

I refer more particularly to the department stores, and the stores selling household utensils, which have a large appeal to the housekeepers. They are organizing well equipped and well conducted departments selling all kinds of electrical appliances. I should like to point out to the central station men that unless they adopt very quickly the highest standards of merchandising methods to offset the appeals made by these other dealers, the central station men will soon find themselves doing very little of the electrical appliance business that is being done in their territory.

I know of one store in our own territory that has organized a very complete department, and in less than a year has put that department where it is paying a nice profit, simply because the department is in their housefurnishing section which thousands of women pass through every week and thus come in contact with the electrical goods. We believe that they are cashing-in to some extent on the advertising which our company does. We have only the appeal of the electrical appliance to get people to our store as compared with the appeal of all the different goods offered in the basement of the department store; therefore we, and every other central station, must make a strong appeal to secure a fair share of the electrical appliance busines.

As a means of meeting that condition, I should like to offer an idea which we have partially inaugurated, and which we will establish to a very much more marked degree in a very short time. In this country at the present time the housekeeping problem is passing through a stage of revolution and readjustment, so to speak. The servant question in America is also changing. I do not know how many of the men here today read the women's magazines. You do not have to wear a wrist watch to do it, but I am quite sure that you will find it profitable to read these magazines every month and also the advertisements which appear in them; not only the advertisements concerning electrical appliances, but all the articles and advertisements relating to housekeeping methods in order that you may get the housekeeper's viewpoint on labor-saving appliances.

I have done that for a number of months, and I have found it very profitable. Some of the ideas which I have received from what the women writers have said about keeping house have helped me to sell labor-saving appliances.

I believe every central station selling electrical appliances, particularly the combined gas and electric companies, should make the office of the company the center for household labor-saving appliances. I believe we should take up locally in a very marked degree the subject of the scarcity of servants and the necessity for women doing their own work, that being a strong reason why they should use every labor-saving device possible. We have established in our company a slogan in connection with electrical appliances—it is: "It makes housekeeping easy." We use that slogan in all of our advertisements, and it will go into all the literature that we publish in regard to any appliances that we sell. We are going to pound that idea into the heads of the women throughout the entire State of New Jersey and we are looking forward to good results.

I have some other ideas which are an elaboration on this which I have just mentioned, but which I am not at liberty to disclose at this time, for we have not yet adopted them, and I do not want the other fellow to do it first. When the plan is working, all may have the information. I really believe that all should take some definite action and take it soon, along high grade lines, or we shall wake up some morning and find that while we think we are in the appliance business and have a lot of appliances in our store to sell, the other fellow will be getting most of the business.

THE CHAIRMAN: Is there any further discussion? If not, Mr. Smith is here for the purpose of answering questions.

JOHN F. KILLEEN, Chicago: I would ask Mr. Smith if the central stations are satisfied with the profit they are making on these electrical appliances.

DORSEY R. SMITH, Baltimore: The margin of profit at the present time will net only about 26 per cent gross. The cost of doing business on the average is about 30 per cent. If we do not increase the gross on appliances, every department handling them is merchandising at a loss.

R. D. CUTLER, Hartford, Conn.: May I ask Mr. Smith why he cares for this class of business if it is run at a loss.

MR. SMITH: I think the time is here when the central station should not charge new business with loss on merchandising. Merchandising is a function by itself, you might say, and the central station merchandising department ought to be in a position to pay its own way and not put a burden on the lighting department.

MR. CUTLER: What is the purpose of putting out these devices?

MR. SMITH: Two purposes, I should say—one is to make a profit and the other to increase current consumption. If you increase current consumption, there is no use doing it at a loss.

MR. CUTLER: That is the point I want to bring out. I do not think from the central station standpoint it is fair to the consumer to expect to make a profit—

MR. SMITH: Fair to the customer?

MR. CUTLER: Yes, the point I am trying to make is this: We are forgetting that the ultimate consumer is expected to pay a reasonable profit on the sale of the current. The object, it seems to me, of merchandising is to introduce the maximum amount of heating devices to the customer at a figure that will enable the central station to make an even break for carrying devices of this class, and enable the company to derive its profit from its original purpose, which is the sale of current.

MR. SMITH: According to that argument, the Standard Oil Company should sell automobiles at cost, because they burn gasoline, and look for its profit in the sale of the gasoline.

MR. CUTLER: Absolutely. Your insurance companies have been doing that for a number of years. They have been putting the first premium paid by the insured into the business, paying the agent practically all of the first premium as commission, and what they do not pay to him they use up in the expenses of the home office, etc., and the profit to the insurance company comes from the renewal premiums.

MR. SMITH: If an article is sold that would consume a product manufactured by a company, then that company, according to your line of argument, would be called upon to sell those articles at cost, so as to increase the consumption of the product manufactured by the company—that would apply to a great many different kinds of manufactured articles.

MR. CUTLER: I do not follow you there, take a particular instance, if you please.

MR. SMITH: If you are selling feed, you should sell horses and all cattle that would eat that feed, according to your argument. I do not see why because of the mere fact that it burns electricity we should be called upon to sell the appliance at cost. I think that the public is willing to pay a fair profit for any article it buys. For instance, if we continue to charge large amounts to business accounts, it naturally keeps the rates up.

MR. CUTLER: Just a second—we are departing from the issue—

MR. SMITH: I am trying to answer that question that we should get a profit on these articles. We must get the money somewhere, and if we do not make a profit on these articles, it must come out of other income. Then current sales must stand that loss, and that, according to my way of looking at it, is not correct procedure in merchandising an article.

M. S. SEELMAN, JR., Brooklyn, N. Y.: It does not seem to me to be good business or in any way necessary, in order to place additional loads on our lines, to demoralize the appliance market, especially as this market is in a period of tremendous development and expansion. We get a suggestion of it from what Mr. Becker said about the money spent in advertising. We are just at the beginning of this development, and it seems to me an inefficient method of development to demoralize your market, as you are bound to do, by unfair competition with others who are also engaged in the selling of the same type of appliances.

This leads up to what I was pleasantly surprised to see included in this report, and that is a page or so on "The Goodwin Plan." I think if the average central station realized the significance of this movement as it applies to appliance development, it would be more interested in the movement than it is, especially in the large communities.

Even a large central station has comparatively few branch offices or salesrooms. In a city of two million, for instance, there may be five or six branches where appliances are sold. It is unquestionably to the advantage of such a station to help in the development, not alone of its own half dozen, but of the hundred or two hundred local depots for the sale of appliances, lamps, etc., which are possible as a result of contractor-dealer activity, so that the consumer, instead of having to go down town or some distance for appliances, may find them in a store "around the corner." But it would not conduce to the development of these local depots to demoralize the market by selling without profit. I believe it is a big mistake to do it, and the whole history of business in other lines shows it to be so.

WALTER S. BYRNE, Omaha, Nebr.: In order to set at rest the mind of the gentleman from Hartford as to the amount of profit there is to be made on electrical merchandising and the reply of Mr. Smith that it is about 26 per cent gross, I wish to say that we are doing our washing machine and vacuum cleaner business on a margin of from 25 per cent to 30 per cent and are not able to show a profit on our general merchandising business even on that basis. I would like to know what steps the Merchandising Committee will take to bring this matter home to the manufacturers of these devices.

VICE-CHAIRMAN LEARNED: We have but very little time left for discussion, but would like to have Mr. Stearns tell us something about his problems.

W. M. STEARNS, Schenectady, N. Y.: I am, as you all know, Supervisor of the Nickel Chromium Patents and, representing the owners of the patents, am responsible for establishing and maintaining the prices and discounts of electric heating appliances under the Hoskins Schedule.

You can all appreciate the very difficult position I am in, in endeavoring to satisfy each of the various classes of trade to which electric heating appliances are sold, and while I have endeavored in the time I have had to solve the many problems in connection with this matter, to be fair and just to each and every one, it seems extremely difficult for me to satisfy all the various interests involved.

Now, gentlemen, the best merchandisers of this country to my mind are the department stores and they are satisfied with 33⅓ per cent. If central station people are not satisfied with what they are getting, it seems to me that they should not come to me for relief but should look into their own merchandising methods for the relief that they wish.

If your merchandising costs are such that you cannot make a profit on the prices you are obtaining today, then look into your own merchandising system and see where the trouble is and do not come to the manufacturers or to me as representing the Hoskins Schedule, for I have not only your problem but I have the problem of the dealers, jobbers and all the licensed manufacturers.

Today the manufacturers of electric heating appliances are obtaining less profit compared with the work they are doing than any other class which is selling and handling electric heating appliances, and yet representatives of each of these classes come to me and say, "We must have more profit."

Apparently the only way in which every one can be satisfied is to raise the retail or consumers' prices to such a high point as to give every class of trade handling this material the amount of profit it wishes. And if this were done, you know as well as I do what would happen.

First of all, the prices would be so high that we would have no consumers able to purchase the devices, and also I fear very much that some of the classes of trade would use these large profits and high prices as an excuse for selling the appliances at prices much less than the established prices.

I do not think the central station people, as a whole, appreciate fully what the owners of the Marsh patent are trying to do. A lot of people seem to have the feeling that the owners of this patent, who are the General Electric Company, owning one-third, and the Hoskins Manufacturing Company, owning two-thirds, endeavored to take hold of the heating appliance situation and force every heating appliance manufacturer to take out a license under the patent and pay large and substantial royalties to the owners of the patent. Such is not the case at all. The royalties paid to the owners of the patent are very small and are a very small item in the manufacturing cost of the heating appliances.

The fundamental reason why the General Electric Company became interested in this matter was first of all to protect its own interests, and second to protect the interests of the central stations in this country. It is too long a story to attempt to give you the details at the present time, but if any of you wish to have them explained to you and will come to me, I shall be very glad to tell you the story, but I do hope that you will not continue to come with the cry, "More profit and more profit."

I think the margin of profit being offered by the heating appliance manufacturers at the present time is sufficient, and stronger proof must be offered to me that a change is necessary before I will make any change in the Heating Device Schedule.

THE CHAIRMAN: That closes the discussion on the Report of the Committee on Merchandising.

H. H. NEWMAN, Trenton, N. J.: I want to move a vote of thanks to the Committee on Merchandising, particularly to Mr. Davenport, the Chairman of the Committee, for the elaborate report submitted.

The motion was duly seconded, put to vote and carried.

THE CHAIRMAN: We will now receive the report of the Nominating Committee.

REPORT OF NOMINATING COMMITTEE

The Nominating Committee of the Commercial Section submits for election as officers and as members of the Executive Committee, the names of the following members:

For Chairman—John G. Learned, Public Service Company of Northern Illinois, Chicago, Ill.

For Vice-Chairman—M. S. Seelman, Brooklyn Edison Company, Inc., Brooklyn, N. Y.

For Vice-Chairman—Henry Harris, Duquesne Light Company, Pittsburgh, Pa.

For Secretary—R. H. Tillman, Consolidated Gas, Electric Light and Power Co., Baltimore, Md.

For Members of the Executive Committee:

Representing Manufacturers—F. H. Gale, General Electric Company, Schenectady, N. Y.

Representing Jobbers—F. A. Ketcham, Western Electric Company, New York City.

Representing Contractors—L. H. Lamont, Chicago, Ill.

Representing Central Stations—R. S. Hale, Edison Electric Illuminating Co. of Boston, Boston, Mass.; I. Lundgaard, Rochester Railway and Light Company, Rochester, N. Y.

Respectfully submitted,

R. R. YOUNG, Chairman,
JOSEPH F. BECKER,
E. W. LLOYD.

THE CHAIRMAN: Gentlemen, you have heard the Report of the Nominating Committee. What action will you take upon it?

MR. NEWMAN: I move that the Secretary be authorized to cast the ballot of the members present for the gentlemen nominated by the Committee on Nominations.

(Motion duly put to vote and carried.)

SECRETARY: I cast the ballot as directed.

THE CHAIRMAN: I take pleasure in introducing Mr. John G. Learned, our new Chairman.

CHAIRMAN-ELECT, JOHN G. LEARNED: You have exhibited unusual tenacity of purpose in remaining at this lengthy meeting and I will not try your patience by making a speech.

The Commercial Section is typical of all that is business. The incoming administration assumes the responsibility of successfully conducting the activities of the Section.

Referring to the work of the Commercial Section, we find that each successive administration has endeavored to surpass its predecessor and it is natural to assume that such is the disposition of the new administration.

To accomplish this end requires the continued cooperation of those who have so ably served in the past, as well as those who have talent but have not as yet participated in the Commercial Section work.

It is my plan to avoid delay in getting our work under way and I would like to meet with those members of the Executive Committee who are present immediately after the adjournment of this meeting, so as to decide upon a place and date for an organization meeting of the Section.

I wish to express to you my appreciation for the confidence that you have placed in me, and thank you for the honor that you have conferred upon me.

CHAIRMAN RUSSELL: I want to thank you all for your patience, your attention and your cooperation.

The Commercial Section Sessions of the Forty-Second Convention of the National Electric Light Association are now adjourned.

REPORT OF COMMITTEE ON THE SALE OF COMPANY SECURITIES TO CUSTOMERS AND RESIDENT CITIZENS

During the past few years a new movement of vital significance to the central station industry has been under way. This movement consists of an effort upon the part of central station companies to distribute their ownership in ever-increasing measure among the citizens whom they serve with electricity. It has become known quite generally as "customer ownership," and has reached a stage where its practicability cannot be questioned. As to the beneficial results from the central station standpoint, only the passage of time will reveal whether the possibilities which seem to be apparent will be realized, and whether the movement can be developed to a breadth where a utility company, at the same time

—will be owned to a considerable extent by a large number of its customers;

—will retain the direction of skilled management;

—will retain the efficiency of private ownership;

—will retain the progressiveness and resourcefulness of private initiative;

—will be free from adverse public opinion.

Your Committee was created in February, 1919, for the purpose of studying the adaptability of commercial representatives for selling company securities direct to the public. It was felt by the Executive Committee of the Commercial Section that the customer ownership movement had grown in popularity to an extent warranting an inquiry as to the relation to it of the Commercial or Sales Departments, and an effort to determine if the trained selling ability already employed by central station companies could be utilized in this new line of endeavor.

Although no time was lost in organizing the Committee personnel from men who have had actual experience in the selling of company securities to the public, the interval at our disposal has

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Manuscript of this report was received April eighteenth.
Read at Public Policy Session.

been too short to permit of the thorough investigation of this whole subject which its importance deserves. We have been compelled to collect such information as member companies were able or willing to supply on short notice, and to prepare a summary of these data.

Involves Far-Reaching Problems

So far as your Committee knows, this is the first report on the subject which has been presented to any national association. We are unable to discuss a single phase of this large question without first devoting some attention to describing the customer ownership plan, the objects sought, the sales results so far obtained and the various methods employed by the central station companies engaged in the innovation.

We wish also to call your attention to the fact that the subject is involved with several of the most stubborn problems of common interest. First it is concerned with that question now convulsing a large portion of the globe—the distribution of property; second, it strikes directly at the heart of the controversy raging over the respective benefits to society of private or corporate ownership and operation of utilities as opposed to public or political operation; third, it bears directly on the problem of obtaining upon the most economical terms the continuously demanded quantities of capital necessary to extend the advantages of electricity to an ever-widening number of people and ever-growing industrial and agricultural activities; and in the fourth place it is intimately associated with the bettering of the common lot by its part in building up habits of saving on the part of the individual and providing him with a safe, marketable and readily available investment.

It is impossible to expect your Committee to make anything approaching a complete exposition of the subject within the confines of this report. Several of the sessions of this convention could be devoted to it and still much would be left unsaid. We realize that the war has seriously interfered with the work of the national associations, and for this reason, doubtless, the subject of the distribution of company securities, or ownership, among the public directly served, has not been reported upon and discussed in our national conferences before.

Considering the incessant attacks which have been made upon all large industrial and business organizations for years, the constant stream of municipal ownership and other socialistic propaganda, the political and economic dislocations caused by the war, and the widespread social unrest, it is proper that movements such as that now under discussion should have keen and exhaustive attention from national organizations devoted to the welfare of great and useful industries engaged in production and service required by the public.

Many Examples of Success

Since 1913 upwards of fifty and possibly one hundred or more, central station companies have sought to interest their customers and other citizens of the communities which they serve in their interest- and dividend-bearing securities. Some of these companies are very large ones, serving under a single organization hundreds of cities and towns of various sizes. Others serve great American cities, and a number are small organizations requiring an inflow of new capital only once or twice in a decade. Forty-eight of these large and small companies during the past few years have marketed locally among a multitude of people—

	$27,134,057	of Preferred Stock
	3,862,500	of Common Stock
	2,294,000	of Bonds
	6,724,600	of Short Term Notes
Total	$40,015,157	of central station securities.

From an estimate, based upon incomplete figures, these securities were distributed among 36,000 individuals or an average purchase of about $1,100 par value, and it is safe to say that 90 per cent of these investors had never before owned a stock or bond of a public utility company.

The figures just given, as before indicated, are by no means complete. A full showing probably would expand them by 50 per cent.

The first step taken by your Committee was to send out a letter and questionnaire to all member companies in the United States and Canada in order to ascertain as nearly as possible what actually had been accomplished. Two hundred and fifty-six companies replied. Of this number

48 have developed direct selling plans for distributing their securities among their customers and resident citizens.

10 endeavor to distribute their securities among resident citizens through banks and brokers.

18 of the 48 first-mentioned companies, in addition to selling their securities direct to the public, also utilize banks and local firms dealing in securities.

208 companies replying have done nothing along these lines.

45 of the companies which have not yet initiated customer ownership work are deeply interested therein and contemplate action.

Among the member companies that failed to reply are a number known to have engaged in the local distribution of their securities with success. Several of these companies are large organizations, and it is regretted that the data derived from their experiences are not available for the purpose of this report. These companies simply did not return the questionnaires, and no additional effort was made to induce them to respond.

Practically all of the companies that have started the distribution of securities among customers and resident citizens are enthusiastic regarding the results already accomplished. Only two companies reported discouraging experiences, both small organizations, one on the Pacific Coast, the other not far from the Atlantic seaboard. One had tried to sell its stock direct to the public by means of a special salesman, but "the public displayed so little interest in the proposition that the salesman was taken off." The other company "endeavored to float its first securities through the local banks. It was a dismal failure and cost considerable money."

Among the companies reporting successful efforts in the local distribution of securities are the following:

Companies Practicing Customer Ownership

Arkansas Valley Railway Light & Power Company..........................Pueblo, Colo.
Cedar Valley Electric Company...........Charles City, Ia.
Central Illinois Light Company...........Peoria, Ill.

Central Maine Power Company	Augusta, Me.
Charlottesville & Albemarle Railway Company	Charlottesville, Va.
Chester Valley Electric Company	Coatesville, Pa.
Coast Power Company	Tillamook, Ore.
Connecticut Power Company	New London, Conn.
Consumers Power Company	Jackson, Mich.
Dayton Power & Light Company	Dayton, Ohio
Denver Gas & Electric Company	Denver, Colo.
Dixie Power Company	St. George, Utah
Edison Electric Illuminating Company	Brockton, Mass.
Electric Bond and Share Company	(Eight Companies, variously Located)
Iowa Gas & Electric Company	Washington, Ia.
Iowa Railway & Light Company	Cedar Rapids, Ia.
Jefferson Electric Company	Jefferson, Ia.
Lincoln Traction Company	Lincoln, Nebr.
Mahoning & Shenango Railway & Light Company	Youngstown, Ohio
Mansfield Public Service & Utility Company	Mansfield, Ohio
Michigan Light Company	Jackson, Mich.
Minnesota Utilities Company	Chisholm, Minn.
Northern Iowa Gas & Electric Company	Humboldt, Iowa
Northern Ohio Traction & Light Company	Akron, Ohio
Northern States Power Company	Minneapolis, Minn.
Northwestern Electric Service Company	Meadville, Pa.
Ohio Service Company	Coshocton, Ohio
Oklahoma Gas & Electric Company	Oklahoma City, Okla.
Otter Tail Power Company	Fergus Falls, Minn.
Ottumwa Railway and Light Company	Ottumwa, Iowa
Pacific Gas & Electric Company	San Francisco, Cal.
Public Utilities Company	Evansville, Ind.
Rochester Railway & Light Company	Rochester, N. Y.
San Diego Consolidated Gas & Electric Company	San Diego, Calif.
Southern California Edison Company	Los Angeles, Calif.
Southern Illinois Light & Power Company	St. Louis, Mo.

Springfield Light, Heat & Power Company. Springfield, Ohio.
State-Centre Electric Company........... Clearfield, Pa.
Toledo Railways & Light Company....... Toledo, Ohio
Union Electric Light & Power Company... St. Louis, Mo.
Western Illinois Utilities Company....... Illinois
Western States Gas & Electric Company.. Stockton, Calif.
Wisconsin Edison Company (Including
Milwaukee Electric Railway & Light
Company) .... Milwaukee, Wis.

Occupies a Middle Ground

Customer ownership, or the sale of utility company securities direct to the public, is a definite and tangible act towards better relations between service companies and the public. This movement tends to destroy the exclusive and privileged atmosphere which has heretofore surrounded the majority of service companies. It seeks unmistakably to unify the interests of these organizations and the people, not in platitudinous fancy, but in sober fact. It represents a willingness on the part of the companies to take the people into partnership and to share whatever profits there may be. With the aid of the partial-payment plan, it gives every worker who can save a dollar an opportunity to become a part owner of the property and to receive a good but not excessive return upon his investment, at the same time providing him a safe investment in an enterprise which is serving and helping to build up his own community, and which he can have at all times under his personal observation.

Customer ownership occupies the middle ground between private ownership and operation as we have known it in the past, and public ownership and operation—that is, by the municipality or the state. It represents an effort to combine generally beneficial features of each and to broaden and extend these benefits rather than to contract them. Holding fast to the principle of individual property ownership as opposed to communism, it seeks to have many people in a given community own in their individual right fractional parts of their utility companies, thereby sharing in the profits, if profits accrue. At the same time it seeks to preserve the initiative, the resourcefulness, the economy and the efficiency of private enterprise. It represents one of those economic compromises which seem to be necessary from time to time in the progress of civilization, which at first inspection seem revolutionary, but which soon become the accepted order.

Irrespective of the comparative merits of public and private ownership, as we have understood these distinctions, we must recognize the fact that a great pressure exists, having as its object the municipalization of the utility organizations; that this pressure has been exerted for many years, and in a considerable number of places has resulted in complete and actual experiments. During the war period this pressure has greatly increased. We cannot be blind to these conditions. We owe it to our industries, to ourselves and to our Americanism to find a solution along what we conceive to be the lines of constructive right.

Your Committee has not made an attempt to secure an estimate of the generally beneficial results to utility companies from the distribution of their securities at home, feeling that the time is not yet opportune for such an inquiry. Many expressions of a general nature came to its attention, bearing out the opinion that the leading objects sought are being realized.

Aims at Ownership by the Many

The original notion of the ownership of a corporation through shares of stock was that of exclusiveness. The fewer shareholders in a successful company, the better for the man who already had an interest in the undertaking. The fewer there were to apportion the profits among, the greater would be the individual gains. From this came the practice, lasting down to our own time and in our own laws, of first offering any new issue of stock to the existing shareholders, before placing such shares on the market. The capital stock of many great American companies—industrial and utility—has been successfully marketed in this way as the business grew, and, in some notable instances at least, it has not prevented the broad distribution of the stock among many thousands of people, through the sale of stockholders' rights, the transfer and breaking up of individual holdings, etc. Aside from the exclusive nature of offering additional stock issues first to shareholders, another principle is involved, that of equity, it being universally recognized that the proportional holdings of an ordinary stock-holder in a company must not be changed without giving him an opportunity to maintain his proportion of the total capitalization by additional purchase. This requirement of stock issues, however, would seem to apply to the ordinary, or common stock, rather than to the preferred stock, which is a class of security based upon the regularity of return to the investor at an agreed rate.

The customer ownership idea, of course, is exactly opposite to the early idea of stock ownership by the few. It aims at stock ownership by the many—the largest possible number—with the retention of direction and immediate control by those responsible for the maintenance and operation of the industry. The questions of control and the financial returns to those who carry on the enterprise, and to those who are willing to assume a greater proportion of the risk of depleted earnings than the man of small means can afford, while deserving careful attention, are not obstacles to the successful working out of the general plan. Like many other difficulties they are not nearly so formidable when actually met as they may appear in advance.

If the management of a utility company is competent and tactful, exercising a proper conception of the rights of its customers, shareholders and public, there is little fear that its body of customer shareholders will desire it dispossessed. As to the financial returns to those who bear the major risk, the general rule of what is reasonable and fair is the only one that can govern. These are questions which have not been raised in criticism of the plan up to this time, but they are natural and obvious inquiries suggesting themselves at once to the casual investigator, and it will be necessary that they be met and dealt with in the future.

Limitation of Earnings and Form of Capitalization

Two outstanding facts have had a tendency to facilitate the broad distribution of central station securities among residents. First, the limitation of earnings by public opinion, by law and by regulation, due to the naturally monopolistic and public character of the industry; and second, the modern form of capitalization of utility companies. As to the first, it is unnecessary to go into detail. Utility companies are now limited to earnings of from 6 to 10 per cent upon the value of their investment, the rate varying in different localities, and to some extent affected by variations in the purchasing value of the dollar. This—in combination with the policy of regulation—means a stabilization of the business, and a reduction of the speculative possibilities to a narrow compass.

The modern form of utility capitalization is devised to secure the inflow of the necessary capital upon the cheapest terms. It consists, therefore, of

Mortgage Bonds
Coupon Notes
Preferred Stock
Common Stock

and it is necessary to preserve the correct balance and proportion among these classifications in order to maintain results of the first order.

The long term mortgage bonds represent that part of the capital amply protected by physical property upon which interest rates are paid to the investor. The coupon notes represent short-term financing, of a more or less emergency or temporary nature, to be retired upon favorable opportunity by bonds bearing a lower interest rate. In order to make the bonds and notes attractive to the investor, there must be preserved a proper proportion of equity or stock ownership. Usually the proceeds of bonds can be utilized for not to exceed 80 per cent of the total cost of construction, and since the bonds are issued for this purpose, it is necessary to find the capital for the remaining 20 or more per cent of construction costs from other sources. Frequently this "other source" is found in preferred stock, upon which a definite rate of return is paid in dividends, but which has neither mortgage rights nor any possibility of a rate of return higher than that prescribed. Into the common stock, therefore, usually are crowded what speculative possibilities may exist and the working control or direction of the company.

It is clear that, taking a company limited to 7 per cent net earnings upon the investment, it can, by paying say 5 per cent to 6 per cent upon that large part of its capital represented by bonds, pay 7 per cent upon that smaller part of its capital represented by preferred stock and, in good years, pay 8 per cent or even more upon the still smaller proportion of its capital represented by common stock—at the same time keeping the profits within the limitation.

Under these circumstances we find a kind of equity security, namely the preferred stock, which is in most cases practically exempt from the hazards of the business and of the effect of fluctuations in net earnings—a security that represents both actual ownership in the enterprise and a reasonably sure prospect of sustained annual returns better than the normal interest rate. The stock also is protected in the respect that if dividends are skipped they must all be paid before the common stock can make a return, and in case of dissolution or sale the preferred shareholders would participate in the distribution of assets immediately following the bond and note holders and prior to the common shareholders.

The limitation of earnings of utilities and the fixed dividend rate on preferred stock, unquestionably reduce the value of existing shareholders' rights to purchase newly issued preferred stock. This particular form of security is bought, not in expectation of a high rate of return or of great enhancement of market value, but as a solid investment, yielding reasonably certain dividends every quarter. This is the general rule to which there are, of course, exceptions. In view of the character of the investment it is a question whether the preferred shareholders are reasonably entitled to priority of purchase of new issues, or any advantage as to price over the general public. As a preferred class of investors they are practically in the relation of debenture holders to the company issuing them, as well as being shareholders. The shareholders' rights meriting real consideration in this sense are those of the common shareholders, as every security placed ahead of theirs to some extent changes the position of the common stock.

This disquisition, tiresome as it may seem, is essential to anything approaching a study of the subject. Just as customer-ownership seeks to bridge the chasm between public ownership and private operation, the preferred stock serves as the middle ground between a security with the lowest yield and the highest safety of principal on the one hand, and the common stock with a maximum of hazard, irregularity of return and the greatest speculative possibilities (so far as anything approaching speculative possibilities can be said to exist still in the electric light and power business) on the other hand.

Preferred Stock Best Suited for Purpose

Therefore, the utility companies that have sought the financial interest of their customers wherever possible have selected their preferred stock as the security best suited to the requirements. There are many other reasons why preferred stock, usually with a 7 per cent dividend yield, is most desirable in the majority of cities and states. The return to the investor will generally compete with other kinds of local investments; that is, it will exceed the net return on first class mortgages and equal or exceed other stocks or participations of equivalent rank. This stock provides an equity investment, and the investor becomes in fact a part owner, sometimes with full voting rights and sometimes not. The dividends are expected to be paid regularly and fully, and the wage earner and the man of small means are not asked to take more than a remote chance of sacrificing principal or yield.

Not all companies are capitalized in the manner described. Some have but one form of capital stock; with others the common stock represents a seasoned and conservative investment, and in some cases the preferred stock has not met its obligations and does not come up to the requirements.

The very nature of the utility business prevents the extension of the customer ownership idea by the sale of stock on a speculative basis. This cannot be done without sowing the seeds of endless discord and confusion. It is necessary to offer the public a sound security, meriting confidence and resting on its stability and the power to pay a regular return somewhat above the current interest yield. The very essence of the plan lies in interesting the people—that is to say, men and women in all walks of life, with all sizes of incomes and degrees of wealth. Failure to pay dividends to a laboring man who has placed his savings in the company would be a very serious thing to him, and would result in a general loss of confidence in the investment which many years of effort could not overcome. No central station company can afford to offer its customers a security in which it has not the utmost confidence as to the regular payment of the agreed return.

The real object of customer ownership is not to sell stock, but to obtain many stockholders. Stock can be disposed of much more readily by working upon a carefully selected list of investors than by trying to secure a given number of very small shareholders from among people not of the investment and often not of the saving class. Selling stock of a well-established utility company is, except in unusual times, simply a familiar business of energy and salesmanship. Creating a large shareholder list from among the people was a new and unchartered undertaking, calling for the development of new angles of endeavor, new methods, new propaganda and a recasting of the relations between the public and the companies.

The salesman of an investment banking house who completes a $25,000 transaction with a single customer considers a good day's work done. The customer ownership salesman does his best day's work when he sells two or three shares of stock to ten or so individuals—and he has had to rise early, travel many miles and make several evening calls if he accomplishes so difficult a feat. A whole month of such effort will usually not produce half the results in the sale of stock as the thirty minutes required by the salesman who approached the large investor. Yet measured in the true interests of the company the laboriously acquired shareholders may be worth many times the large shareholder.

Financing a Primary Problem

Financing extensions and additions always has been a primary problem with utility companies. It costs great amounts of money to build them, reconstruct them and keep them abreast of the growth of the territories which they serve. New capital is demanded year by year in enormous sums. Several years ago Mr. Frank A. Vanderlip estimated the new capital annually required by the utilities at $400,000,000. The large investment banking houses of the country have performed this work in the past, and the growth of customer ownership will not relieve them of the major part of it in the future. Customer ownership will serve as a means of equity financing very well, but it cannot, except in comparatively few places, do the major financing—that is the distribution of bonds and notes. Part of the capital may be obtained at home, but not all of it. Great amounts of money must continue to be raised in the future as in the past, by the investment banking houses which possess the confidence of large numbers of substantial investors and the selling mechanism necessary to secure a wide distribution. But the building up of shareholders' lists at home will add to the stability of the company, will confer upon it the insurance of the friendly interest of numbers of those who hold voting power over it, and is strong evidence to the far away investor that the company whose bond he is asked to buy stands well at home. Briefly, customer ownership will facilitate the work of the investment banking house and will partially relieve the banker of the difficult work of selling stock, as compared with bonds.

Successful Selling During the War

During the war it was impossible for investment banking houses to sell large quantities of the preferred stock of utility companies except at prohibitively low prices. Upwards of half a hundred utility companies did sell their preferred stock direct to the public at good prices during this very period. A vivid object lesson was provided of what can be done along these lines under severe stress. These fifty companies probably sold upwards of $20,000,000 of their preferred stock in their respective communities during the war. The majority discontinued active efforts after the Second Liberty Loan, but a number kept right on because they needed capital for equipment to serve war industries, discontinuing sales work only during the Liberty Loan drives. The companies that kept on were generally successful. Several of the Byllesby companies made high monthly sales records during the heatless Monday period of the winter of 1917-1918. The month before the tide of battle changed in France, 175 preferred stock prospects were induced by a window display to walk from the street into the office of The Minneapolis General Electric Company.

Customer ownership secured the money for these companies when they needed it the most and did it on a cost basis comparable with and better than many of the short time bond and note issues. Even though people were subscribing in an unprecedented way to huge Government loans, numbers of them found it possible to invest in the preferred stock of their utility companies when the stock was offered direct and the construction necessities were explained to them as not inconsistent with patriotism.

Investment Merit Well Established

The general opinion held by the public regarding most public utility companies is that they are financially successful—for the owners. These industries have been well established, have grown rapidly and have expanded their business and property. They occupy large and prominent offices and their service is an everyday incident in the lives of the people. In one way or another they are much in the newspapers and in the public eye. When they are criticized it is usually for making too much money. The majority have reflected the atmosphere of prosperity.

All this is a far cry from the days when a shrewd investor told his secretary to throw Bell out of his office if he came again and sought money to develop the telephone. Most utility companies had to beg for funds with which to get started. Now they have long proved themselves and have become objects of jealousy and suspicion because of their very success. The people take it for granted that an investment in these companies is desirable. If a company in good standing offers its preferred stock as an investment and says that it can and will pay 7 per cent annual dividends, no one disputes these statements or questions the ability of the company to meet the obligation.

Prospects infrequently care to study earnings statements or to analyze the investment. They are interested (1) in the price, (2) the yield, (3) in the marketability of the security if they desire to convert it into cash. Now and then a man comes along who desires to study the company and its condition, but the majority of home investors are merely bored by an array of facts and figures. Companies go along successfully advertising month after month without making the slightest reference to earnings or presenting earnings figures, and hundreds of sales are made without a single reference to this subject. Central stations do not have to parade their ability to pay preferred stock dividends or to prove their prosperity.

Selling in the Face of Rate Increases

The war not only brought a period of excessive interest rates, but it forced upwards the operating expenses of central station companies to unheard-of levels. In thousands of cities it was necessary to obtain increases in service rates. These increases could not be obtained without a showing of their necessity and a strong presentation of the facts in order to obtain the desired relief.

Now a company cannot sell its preferred stock on the theory that it is losing money. Here arises a situation of apparently hopeless conflict. How would it look to a citizen if he received a letter one month explaining why the company needed higher rates in order to stay in business, and the next month or so received a letter suggesting that he invest in company's 7 per cent preferred stock as a security in all respects desirable for the depositary of his surplus funds? On the first inspection it seems utterly absurd to expect anything except disaster both to rate increase applications and to the sales of preferred stock.

The fact remains that a number of companies did both and succeeded in both. The Northern States Power Company and the San Diego Consolidated Gas & Electric Company, for example, had to increase rates and did so—the first named being for the most part not under state regulation—the latter receiving the approval for rate increases from a State Commission. During 1917 and 1918 the preferred stock sales of these companies in home territory was as follows:

	1917	1918
Northern States Power Company......	$945,900	$1,874,800
San Diego Consolidated Gas & Electric Company......................	318,400	159,100

It will be noted that the Northern States Power Company sold twice as much stock during 1918, the year of heaviest rate increase, as it did in 1917.

In cases such as those just referred to it is necessary to insist that preferred shareholders—at home and elsewhere—are entitled to their 7 per cent dividends, and it is necessary to point out to the prospective investor that the stock during such a period can be purchased at probably the lowest figure it will ever reach. Once the rate increases have become effective, the investor does not have to have the fact that the advance has been accomplished called to his attention. It is possible to find utility operators since the war who are convinced that the only defensive worth while is an attack—an old belief of many commercial representatives.

Effect of Liberty Bond Campaigns

The net result of the Liberty Bond successions has been a nullity to date, but the future effects should be helpful to the local sale of central station securities. The educational effect of the war financing will remain, but while these drives are in progress they prevent many persons investing in utility securities. In the face of the five war loans it has been excedingly difficult to maintain customer ownership methods, and where they were maintained successfully unusual exertion has been demanded.

Several companies conducted highly successful campaigns in 1918, but it can hardly be said that the Government financing was helpful, as the educational value was offset by the demands for cash.

In several cities the educational work in investment securities previously performed by the central station companies was of distinct assistance to the first Liberty Loan campaign. Verification of this statement will be found in the large number of individual subscriptions to the first Loan in Minneapolis compared on a per capita basis with those of other cities, and to the fact that the manager of a securities sales department in Saint Paul was requested to devise the partial-payment plan employed in that city for the first Loan. In these cities customer ownership had been advertised extensively for two years prior to the first Loan and the Company had several thousand home shareholders. Its stock sales fell off slightly the first year of the war, but in 1918 largely increased, as previously referred to, due to unusual sales and advertising efforts. The Loans, however, convinced many utility managers of the possibilities existing among the public for the distribution of sound securities in small lots, and no doubt stimulated some of the utility campaigns in 1917 and 1918. The actual effect of a Liberty Loan drive upon a company continuously engaged in the direct sale of its securities is to reduce sales seriously for a period of about two months.

Two Broad Methods Employed

A study of the selling methods followed shows that they fall into two broad divisions, which may be described as the

1—Short campaign method

2—Continuous selling method.

Both have been rewarded with successful results. One company, the Central Maine Power, has combined the two. The choice is determined by the circumstances of any given situation and the relative importance of the objects desired. If, for example, the most pressing requirement is the raising of capital quickly, the campaign method is the one selected. On the other hand, if a company wishes to obtain the utmost from an advertising and public relations standpoint, continuous systematic selling brings not only the maximum in public good opinion, but a larger proportion of investors from among the wage-earners. A selling drive, no matter how successful, is forgotten by the public in a short time, while continuous selling means calling the attention of citizens to the broad policies of the company and its democratic character at frequent intervals.

With respect to the cost of advertising and selling, the campaign method usually is the most economical, other conditions being equal. However, it must not be forgotten that the market developed by continuous selling constantly broadens and that a foundation is being laid for very low selling costs in the future. Where, during the first few years of the innovation, expensive sales departments may be employed, eventually it will be possible to dispense with much of the force and expense, and handle a large volume of business by means of advertising, an office man and a stenographer. Such a point has already been reached by one large company—the Pacific Gas and Electric Company—which has kept its selling costs per share very low. The continuous selling method naturally must be stimulated by special efforts of one kind or another, sometimes on the campaign order.

The two divisions of method have a great deal to do with the character of the sales organization necessary to handle the work. As related in this report, a number of successful customer ownership campaigns have been held without the organization of securities departments, the employment of securities salesmen or the devotion of the major time of any one department. By confining the endeavor to a comparatively brief period and by calling upon all executives, departments and employees for intensive cooperation, it has been possible to obtain wonderful results in connection with advertising. In these cases only two or three members of the staff were wholly engaged in the campaign, while a large number of employees devoted some attention to it without interfering with their regular duties. At Los Angeles, Rochester, St. Louis and other places this was the scheme decided upon, and the results speak for themselves, while the low selling costs are also in evidence. In some campaigns no commissions are paid to employees, in others a very small commission has been allowed.

Continuous Selling Demands Special Organization

Where the continuous selling method is decided upon, either from the prospective difficulty of the undertaking—the unfamiliarity of the public with security investments, the high local interest rates. etc.—or for public policy reasons, general opinion seems to indicate the feeling that it is necessary to organize special security sales departments, whose personnel derive their bread and butter from one line of effort alone. Where a special department is concentrated upon the job it is necessary to pay adequate salaries or commissions, as the manager and salesmen must make their living from the work and be paid enough to stimulate them to vigorous effort. The work is not of a kind attractive to the average securities salesman capable of holding a place with a reputable investment banking house, because the large orders are few and far between and success consists of a multiplicity of small sales. Neither are the average emoluments tempting to the central station commercial salesman who has achieved a reasonable degree of success. As in every other line, men are developed in customer ownership selling who make much more money than the average, but the earnings ordinarily possible are no more than the average in most sales departments.

The most successful securities sales departments have been recruited from among other departments of the company, including the commercial department. In all cases careful instruction and conscientious study on the part of the salesman has been necessary in order for him to fit himself for the task. The chief requisites are not only a fair degree of selling ability and a fund of cheerful optimism, but a real liking for investment subjects, no fear of hard physical work, and willingness to sacrifice many evenings and holiday hours and above all an absolute faith and confidence in the company.

Commercial Departments May Be Used Advantageously

In one or two instances only has local securities sales work been turned over exclusively to the Commercial Department. The amount of securities to be placed in these instances was comparatively small but the departments have performed the undertaking economically and with entire success.

There is no doubt in the opinion of your Committee that any fairly large and well organized Commercial Department could engage in selling securities and do as well as the achievements in selling service and merchandise. This would be accomplished, however, not by loading up the present force with preferred stock or short term notes as a side line, but by creating a sub-department whose staff would be engaged exclusively in selling securities. The Commercial Department manager would man his securities sub-department with employees displaying particular aptitude for the work, and would bring into play all of those cooperative and coordinate activities contributing so largely to any organized effort. Under such a plan the compensation of securities salesmen would be fixed with reference to the actual sales effort and ability required and in harmony with the commercial sales talent of the organization.

Your Committee can see no reasonable objection to the utilization of Commercial Departments in securities sales work, but on the contrary believes that there would be many advantages in such a combination. The sale of securities does not differ fundamentally from the sale of any other service or commodity. The requirements of demand, ability to purchase, and value to the purchaser are found in preferred stock as they are in electric power. A housewiring salesman would not think of trying to sell a 1000 horse power block of energy without being familiar with the power business, nor would the manager of a Commercial Department expect to market a large amount of his company's preferred stock until he thoroughly understood both the security and the broad subject of investment, local and national.

Up to the present the selling activities of central stations have been concentrated in the Commercial Departments with results of undisputed value to the industry. The duties of the Commercial Department have grown and expanded with the development of new uses for electricity. No company would create a special department outside of the Commercial Department to sell electric ranges, even though the company were about to sell electric ranges for the first time. The normal division of labor in central stations is by functional activities, just as it is in the broad scheme of human affairs. That is to say, engineering falls to engineers, construction to people who build, operation to the men who keep the machinery moving, bookkeeping to bookkeepers, and so on, and it is obvious that selling should devolve upon those who have particularly qualified themselves to market the products of the industry.

If the selling of securities is no longer to be the exclusive function of the investment banking houses or the bond departments of utility organizations, which are selling experts per se, we believe that the selling ability already possessed by central station organizations should be called upon. We realize also that in the event that the Commercial Department is called upon for the sale of securities, the duties and responsibilities of the department manager are increased and he should be financially rewarded in proportion thereto. The commercial department manager cannot be expected to enlarge his field and perform the direction of an exceedingly difficult new task in connection with his other duties, without suitable compensation.

Advantages from Commercial Departments

Aside from the experienced selling direction of the manager, some of the advantages to be gained by consolidating local securities sales with Commercial Departments would be as follows: (1) general familiarity with the field, its business activities, residents, their wealth, etc.; (2) personal acquaintance of manager and salesmen with customers, citizens, newspaper men, leaders of activity, etc.; (3) ability to secure leads and suggestions from men and women employed in commercial sales work who meet large numbers of people and visit all parts of the community served; (4) available supply of salesmen from whom to select candidates for security sales work; (5) the general atmosphere of the department in optimism, constructiveness, push and the determination to accomplish difficult things; (6) the ability to speak from first hand knowledge of the company's business, growth, prospects, etc.; (7) economies in the cost of selling by consolidating the executive duties, advertising, office labor, floor space, etc.; (8) facility of combining stock sales with the cost of financing extensions; (9) ability of promoting commercial lighting and power sales by the sale of securities; (10) flexibility of sales force whereby salesmen in one class of work may be transferred to another in case of slack business, or temporary relinquishment of effort along particular lines; (11) broadening of the opportunities for salesmen and improvement of material for entrance into the department; (12) simplification of organization; (13) coordination in public relations problems and building up good will.

Conclusion

In conclusion, therefore, we recommend where practicable the employment of Commercial Departments for the selling of company securities direct to customers and resident citizens.

Respectfully submitted,

W H Hodge, *Chairman*
Franlin L Hall
C M Hamilton
A F Hockenbeamer
A N Kemp
H Spoehrer
E F Stone
C L Van Valkenburg
P H Whiting
C E Yacoll

APPENDIX A
REPORT OF COMMITTEE ON THE SALE OF COMPANY SECURITIES TO CUSTOMERS AND RESIDENT CITIZENS

A brief account of home security sales by certain of the member companies reporting to the Committee should be of interest.

PACIFIC GAS AND ELECTRIC COMPANY, SAN FRANCISCO, CALIFORNIA

The first organized effort by a very large company to distribute its stock in home territory was made by the Pacific Gas and Electric Company, which serves 178 cities and towns and an immense area in California. The successful outcome of this plan attracted national attention and had a pronounced influence upon a number of other large companies contemplating similar action.

Since July, 1914, the Pacific Gas and Electric Company has built up a home shareholder list in excess of 6000 people, who own $8,359,300 of the Company's 6 per cent first preferred stock. Of this amount $3,785,100 was placed in a year of financial stringency—1915. Advertising and active efforts to push the sale of the stock ceased in April, 1917, on account of the country's entrance into the war. Nevertheless since that date $250,000 of the stock has been sold as the result of the momentum gained in previous years and the advertising power of the regular quarterly dividend checks.

During the time that the Company sold $8,358,300 first preferred stock to residents, an additional $6,396,200 par value of this stock was disposed of to previous shareholders and through eastern investment bankers. It is evident, therefore, that the Company was well able to sell its stock abroad as well as at home and that the home sales did not interfere, to say the least, with the outside market.

The Company established a stock sales department in July, 1914, at the inception of the stock selling campaign. The department consisted of the manager and one stenographer and is under the general supervision and direction of the second vice-president and treasurer. At the beginning of the campaign the services of several members of the Commercial Department, who were ordinarily engaged in soliciting electric and gas business, were utilized in obtaining subscriptions, but they were discontinued after a few weeks. Heads of departments, district managers and in fact all employees are supposed to do all they can in a general way to assist the stock sales department in securing prospective investors. No commissions are paid.

Newspaper advertising and circular letters, plus the efforts of employees, have been depended upon to develop prospects. The manager of the stock sales department was without previous experience in selling securities, and the advertising matter was prepared chiefly by the second vice-president and treasurer.

The partial payment plan calls for purchase of the stock at $90 per share to be paid for in six equal installments of $15 over a period of thirteen months.

Companies under the Management of H. M. Byllesby & Company

Among the management organizations, H. M. Byllesby & Company, as the result of an experience over several years with customer ownership, are firmly committed to the principle. Already the plan is in effect in three-fourths of the cities and towns served by their companies, and it is intended to extend it to the others as rapidly as possible. Since June, 1915, six of the Byllesby companies have distributed about $6,500,000 of 7 per cent preferred stock among upwards of 8,500 resident citizens, in addition to several millions of bonds and notes, the latter usually being placed locally in conjunction with banks and bond dealers. The companies practicing customer ownership are Northern States Power Company, Arkansas Valley Railway, Light and Power Company, San Diego Consolidated Gas & Electric Company, Western States Gas & Electric Company, Oklahoma Gas and Electric Company, and Ottumwa Railway and Light Company.

The Byllesby companies from the start have persistently sought the interest of the wage-earner and the citizen of average means. The work has been a feature of their public policy, and the primary object has been the making of stockholders with supplemental financing as a secondary motive. It has been carried out under the leadership of Mr. O. E. Osthoff, vice-president, and the general supervision of the Bond Department of the managing organization, assisted by other departments and with the cooperation of resident managers and their staffs. Various local methods have been employed, all of them using newspaper and direct-by-mail advertising as a basic feature, but employing a variety of arrangements with reference to the executives and employees handling sales.

In the larger situations separate securities sales departments have been organized, charged exclusively with the particular endeavor. This is also true at places where for one reason or another the work has been particularly difficult. In other cities the resident manager and one or two of his staff personally have placed large amounts of securities and they do not regard special securities salesmen as essential. In one company a successful record was made by the existing department heads in conjunction with an investment banking firm.

The Byllesby companies offer their securities to the public continuously except during Liberty Loan periods. Advertising is done at regular intervals. Intensive campaigns are carried out as occasion demands, but for the most part the effort is steady, persistent and methodical. In no place has the Commercial Department been made responsible for the work, and in only a few instances have the commercial men been asked to do anything other than report prospects and negotiate occasional sales of stock in connection with the financing of extensions. Commercial salesmen have discovered that many times their projects are facilitated by the stock sales policy of their company.

About 25 per cent of the new resident stockholders are made by Byllesby companies through the partial payment plan, but only about 10 per cent of the stock is sold in this way. The partial payment plan in general use calls for a first payment of $5 a share and monthly installments of the same amount. The stock does not become the property of the investor until fully paid for, nor does he receive the dividends during the purchase period, but he is credited with interest at 6 per cent on payments. A certificate resembling a stock certificate is issued as a receipt for the first payment and subsequent deposits are noted thereon.

When the work is inaugurated at a property much care is taken in informing and interesting the executive staff and in utilizing all avenues and possibilities of favorable publicity. The plan is launched as an innovation in public relations and its broad economic features are particularly emphasized. The news and editorial cooperation of the press is requested and a surprising degree of cordiality towards the plan has been the customary response.

The effort of Byllesby and Company is not only to distribute the preferred stock of operating companies as widely as possible among customers, but to secure full advantage of the democratic and popular features of the work, a point never overlooked in the liberal advertising practiced.

For a number of years the securities of Standard Gas & Electric Company, which owns investments in all of the companies under Byllesby management, have had increasingly broad distribution among the public throughout the country, and these securities have been purchased by residents at many local properties.

Companies under the Management of Henry L. Doherty & Company

Indicative of the present-day attitude of some of the larger utility operating firms is the action now being taken by Henry L. Doherty & Company in the organization of a special department to have charge of the local sale of securities in the many cities served by utility companies under their management. The Doherty organization experimented with customer ownership at Denver, Mansfield, Ohio, and Toledo with excellent results, particularly at Denver, where $1,500,000 of the 6 per cent preferred stock of the Denver Gas & Electric Company has been distributed among a large number of residents. Apart from the direct sale of operating company securities in their home towns, Doherty & Company have achieved a wide distribution of the preferred and common stocks of their holding company—The Cities Service Company. In many communities served numbers of investors are interested in Cities Service securities.

Mr. W. B. Jackson, assistant manager of the Bond Department of Henry L. Doherty & Company, says: "At Denver, Mansfield and Toledo sales of local company securities are under the direction of district sales managers reporting directly to our Bond

Department and under our supervision. At other points sales have been largely in charge of some official of the local operating company, and, of course, the degree of success attained has been entirely dependent on the attitude of the officer in charge of the sale of securities. We are just now beginning to take up the matter of sales to customers and resident citizens in a practical way, and are now organizing a permanent Customers Sales Department, which we hope to have in effective operation within a short time. We believe from our experience that this work must be carried on through a department devoted solely to extending and looking after it."

This organization has worked out a partial payment plan for the various forms of securities issued by Cities Service Company which, no doubt, extends to the operating units. This plan is based upon immediate ownership by the investor of the security purchased, the security itself being held as collateral until payments are completed. The investor receives the dividends or interest and is charged at the rate of 6 per cent interest upon his uncompleted payments. For the preferred stock the basis is $20.00 per $100 par value initial payment; monthly installments $5.00 per share; common stock and bankers' shares, one-third of market price initial payment, balance in twelve equal monthly installments; bonds and notes, $10 per $100 face value, initial payment, balance $5 monthly; interest charged is to be equivalent to the yield to the investor, but not less than 6 per cent.

Iowa Railway and Light Company and Allied Interests

The Iowa Railway and Light Company and allied companies, namely the Iowa Electric Company and the Iowa Falls Electric Company, maintain a Financial Department, which was organized in May, 1913. These companies serve many communities in Iowa and maintain headquarters at Cedar Rapids. The Financial Department is in charge of a fiscal agent at Cedar Rapids, branch offices being maintained at Marshalltown and Boone. Three securities salesmen devote their entire time and energies to the work.

From the time of its organization in 1913 to March 1, 1919, the Financial Department placed $6,325,629 of various forms of securities among citizens in and near the territory served by the

Company. Of this total $3,592,404 consisted of the 7 per cent preferred stock of the Iowa Railway and Light Company. Other securities placed were: Iowa Electric Company, $312,900 7 per cent preferred stock; $214,175 common stock; $1,145,000 20-year 6 per cent gold bonds; Iowa Falls Electric Company, $108,550 common stock; $407,600 5-year gold bonds and $95,000 collateral notes. No exact record of the number of home shareholders or investors is available, but the number is unquestionably large.

This is one of the most conspicuous examples on record of the successful distribution of securities in home territory. It is particularly interesting not only because of the volume of financing, but by reason of the location of the field covered, this being comprised of medium and small-sized cities, towns and agricultural districts in a state where the people have not had a long or extensive experience with investments in corporation stock and bonds. The variety of securities put out direct by the organizations also is of special interest.

The cost of marketing the securities varied with the character of the offering. The cost of handling the preferred stock of the Iowa Railway and Light Company over the six-year period is about $6 per $100 share. Salesmen are paid on a commission basis, the percentage ranging from 2½ per cent to 7½ per cent. Salesmen earn $2,000 to $8,000 a year. Company employees are paid a commission of 2 per cent on sales closed as the result of prospects developed by them, but an inconsiderable amount of business comes from this source. Banks and brokers are allowed 2 per cent on sales which they may make.

Various plans are used to develop inquiries—newspaper advertising, direct-by-mail effort and personal canvassing. A very simple partial-payment plan for buying the preferred stock is in effect, the minimum rate being $5 per share per month. A card duplicate of the agreement is given the investor for his receipt and subsequent payments are receipted on the reverse of the card. Interest is allowed, payable quarterly, at the rate of 7 per cent, and the interest may be applied on the principal. Whenever the payments equal the price of one share of stock, the share is to be issued and delivered. If an investor desires to withdraw his capital before the payments are sufficient to purchase one or more shares of stock, the payments shall be returned to him with interest at the rate of 5 per cent.

NORTHERN STATES POWER COMPANY

Northern States Power Company not only markets its 7 per cent preferred stock continuously in its territory, but concentrates upon this particular form of security to the exclusion of bonds, notes, common stock, etc. Bonds and notes of the company are distributed locally to a limited extent by investment banking houses. This company serves Minneapolis, St. Paul, Stillwater, Mankato, Faribault, Fargo, Grand Forks, Minot, Galena and about 190 other cities and towns of the central northwest. It began selling preferred stock to its customers and resident citizens in June, 1915, and now has upwards of 6000 home shareholders, who own about $4,600,000 of the 7 per cent preferred stock.

This company maintains two securities departments with offices in Minneapolis and St. Paul, in charge of managers at both places. About 15 salesmen are regularly employed on a drawing account and commission basis, the commissions ranging from 2½ per cent on orders up to and including five shares to 1½ per cent, according to the character and amount of the sales. Inquiries are developed by newspaper advertising, direct-by-mail circularization, the suggestions of shareholders, from coupons on service bills, leads from executives and employees of other departments, window displays, etc. No compensation is given employees suggesting prospects. Salesmen visit cities and towns outside of Minneapolis and St. Paul from time to time. Division managers and auditors make direct sales.

The company's advertising methods are notable for their democratic character, the appeal nearly always being to wage-earners. Advertisements invariably carry inquiry coupons and circular letters contain an unstamped return card. Inquiries are followed up by an information sheet, an illustrated descriptive booklet and a salesman's personal visit within two or three days. Inquiries from a distance are handled by personally dictated sales letters, no form letters being permitted. Cost of selling varies according to the general situation affecting investment capital. Stock is sold at prices corresponding with market conditions.

Union Electric Light and Power Company, St. Louis, Mo.

The experience of the Union Electric Light and Power Company of St. Louis is a successful example of the campaign method of distributing securities locally, as opposed to the continuous selling method. It is also of unusual interest because the sales were made by employees of the company, the Commercial Sales Department being utilized particularly and no special securities salesmen being used. In 1917 and 1918 this company sold direct to its customers $1,961,356 of its 7 per cent preferred stock, thereby adding 2,585 citizens to its list of shareholders. The average investment was 6.86 shares per individual. The total cost of selling amounted to but $1.22 per share, and the stock was sold at $102.

The Union Electric Light and Power Company also markets its interest-bearing securities among the local public, selling such securities through the banks. In 1918, $1,800,000 of two-year, bond-secured 6 per cent notes were distributed in this manner.

The preferred stock sales were conducted under the supervision of the secretary and treasurer. All employees were requested to solicit subscriptions. The contract solicitors of the Commercial Sales Department did a considerable part of the work. Newspaper advertising and personal solicitation of employees were depended upon to produce results. A commission of 1 per cent was paid employees for sales made directly by them, the average earnings per employee affecting sales from this source being $47.35. While the results obtained from utilizing existing departments were very satisfactory, these efforts interfered somewhat with their regular duties. Teams were organized in the various departments and a premium paid the team securing the greatest number of subscriptions.

Installment plan called for $10 per share at $102 with subscription; balance at the rate of 10 per cent per month with monthly service bill. Interest is paid quarterly at the rate of 5 per cent, company agreeing to refund all moneys received prior to final payment if desired by investor.

Companies under Management of Hodenpyl, Hardy & Co.

The Hodenpyl, Hardy Companies utilized the customer ownership principle during the war as a means of financing extensions to gas and electric customers. Other companies selling their securities locally did the same to a limited extent, but this was the only manner in which the Hodenpyl, Hardy companies sold their securities direct, no general advertising or selling methods being used. These companies—the Consumers Power Company of Michigan, the Michigan Light Company, Central Illinois Lighting Company, Northern Ohio Traction and Light Company, Public Utilities Company (Evansville, Ind.), and the Springfield (Ohio) Light, Heat and Power Company—collectively disposed of $307,900 of 6 per cent preferred stock among 363 of their customers. The stock sales were handled by representatives of the Commercial Department.

A considerable amount of the securities of these companies has been purchased in the past by their customers through investment banking houses.

Central Maine Power Company

Central Maine Power Company, with headquarters at Augusta, serves 83 cities, towns and villages, with a total population of 150,000, no town having more than 15,000 people. Practically all of its many shareholders reside in the territory served. It encourages home ownership both by the direct sale of its 7 per cent preferred stock to residents and all of its securities through investment banking houses. For some time special efforts have been made by the Company in the direct sale of its preferred stock at a price of $107.50 per share, with gratifying results. The stock is sold continuously, sales being stimulated from time to time by special drives or campaigns. Employees of all departments are utilized and one special securities salesman as well. An interesting plan of employees' stock selling contests has been worked out, supported by the Company's weekly publication. Certain employees, particularly Commercial Department representatives, relinquish their customary duties when engaged on stock-selling drives.

The advertising manager of the Company is in charge of the campaign salesmen and of employees' selling contests. The campaign salesmen are recruited principally from the housewiring salesmen. In the employee contests, sales have been made by employees as follows: District superintendents, 32.5 per cent; town representatives, 24.4 per cent; department heads, 12.9 per cent; linemen, 4.5 per cent; inside wiremen, 4.7 per cent; retail salesmen, 4.3 per cent; station operators, 4.1 per cent; common laborers, 3 per cent; women employees, 3 per cent; engineering department, 2.6 per cent; construction and line foremen, 2 per cent; street railway men, 2 per cent. These figures include both employees' sales and amounts purchased for themselves.

In the stock selling contests every employee is qiven a quota, depending upon his job and his probable opportunities to sell. Department heads are given a quota of fifteen shares, to be sold in a contest of two months' duration; town representatives, 7 shares; linemen and station operators, 2 shares, etc. Many small prizes are offered, chiefly in thrift stamps, to the value of about $100, some paid weekly, some for the entire contest. The employees' weekly publication is used to publish descriptions of the plan, instructions how to sell, standing of contestants, names of winners and matter to keep up interest. Liberal advertising is done in the newspapers. Before a campaign is started in a town, the ground is prepared by the advertising, and the town representatives check over the customers and make a list of prospects. Usually a personal canvass is made of about 25 per cent of the Company's customers. The advertising is found useful in convincing people of the merit of the investment. Employees receive 50 cents per share on sales made to prospects whom they develop but to whom someone else sells.

The total cost of selling averages about $5 per share. Stock is sold on installments as well as on cash basis—to the public at the rate of $10 per share per month and to employees practically on terms to suit themselves.

EDISON ELECTRIC ILLUMINATING COMPANY, BROCKTON, MASS.

The laws of Massachusetts are not conducive to customer ownership. Not only is the general principle strictly enjoined that any new issue of stock must first be offered to the existing shareholders, but it is prescribed that if the shareholders do not buy the new stock it must be sold at auction. Nevertheless, one Massachusetts company—the Edison Electric Illuminating Company, of Brockton—has proved that the customer ownership method may be applied with an interest-bearing security as a medium as well as with shares of stock, which do not have a day of maturity payment like bonds and notes.

In the winter of 1917-18 this Company executed a spirited and successful campaign for the local distribution of its two-year 6 per cent gold coupon notes, sold at a price to net the investor 7.14 per cent. The campaign was conducted by the head of the power sales department, assisted by two power salesmen, and with the cooperation of all departments. Newspaper advertising was employed extensively. Total sales were $251,900 par value to 768 residents—an average distribution of $328 per investor, this latter fact being a remarkable commentary upon the good advertising and salesmanship employed. No commissions were paid. The cost was less than 1 per cent.

SOUTHERN CALIFORNIA EDISON COMPANY, LOS ANGELES, CAL.

A remarkable success in customer ownership was achieved by the Southern California Edison Company (serving a population of over 1,000,000) in the latter part of 1917. This effort is notable in at least four respects: (1) The security distributed was the common stock of the company which is preceded both by preferred stock and interest-bearing securities; (2) the total selling cost was but 16 cents per share; (3) the task was accomplished by thorough cooperation of all departments of the company plus newspaper advertising and some assistance from the banks, and (4) out of the $3,000,000 of common stock distributed, $2,782,000 was placed in a six weeks' campaign.

Offsetting, but by no means depreciating, these results is the fact that of the 1946 new shareholders—residents of Los Angeles and surrounding towns—added to the Company's books more than one-half were executives and employees of the Company. Obviously when such a large proportion of the investors are from the ranks of the organization, and when the selling effort extends over so short a time, the effect is bound to reduce the selling cost per share. Many of the other companies submitting data have sold but a negligible amount of securities to employees, the great majority of the new shareholders not having been connected with the company in any way.

In the opinion of the Southern California Edison management, newspaper advertising, preceded by a complete circularization among the company's customers, was responsible for at least 60 per cent of the sales made to the public. About 15 per cent of the total sales were made through 53 banks, cooperating with the Company, with no consideration excepting the temporary increase of deposits and a degree of advertising, all of the banks being depositaries of the Company. No appreciable success rewarded the effort of local brokers to handle the securities on a 1 per cent commission basis.

The Company began selling stock to its employees and customers in August, 1917, and discontinued the following November to avoid any possible competition with the Government war financing. The common stock offered has paid dividends at the rates of 5 per cent and 6 per cent per annum since 1910, and since June, 1917, at the rate of 7 per cent. It was offered to the local public at $89 per share for cash and $90 per share on the installment plan. The price to employees was $88. Although the campaign closed in November, 1917, during 1918 customers of the company purchased $218,000 of the stock. The total number of common shareholders was increased from 1346 to 3292, and the average holdings decreased from 81.79 shares per individual to 49.6 shares.

The campaign was personally supervised by the comptroller of the Company, who established permanently a small Securities Department, comprised of a manager—a young man formerly in the Commercial Sales Department, but without financial experience—an accountant, and, temporarily, three salesmen from the Commercial Sales Department. The Securities Department issued the stock, handled payments, gave out information, had charge of mailing of dividends, etc. It may be said, however, that the Company's entire force, in a way, became a sales organization, as prior to opening subscriptions meetings were held in all of the Company's twenty-odd districts, at which practically all employees were in attendance, and the plan of the campaign was carefully explained to them, not only as to sales to the public, but sales to themselves as employees. The assistant agents, or local managers, became direct sales representatives and contributed a great deal towards the success of the campaign. About one-third of the Company's employees became shareholders. A carefully prepared newspaper advertising program was carried out in Los Angeles and all districts served by the Company. A printed circular describing the plan was personally distributed to all customers by meter readers, salesmen on their rounds, etc., who did not attempt to secure subscriptions, but merely called the recipient's attention to the literature and supplied information upon any point inquired about. As a result of the employees' meetings—some lasting for hours—practically everyone connected with the Company became well informed regarding the stock and the financial status of the organization. They thereupon cooperated effectively in making the campaign a success, largely by "boosting" and locating prospects. The newspaper advertising was not started until after the meetings had been held and the circulars distributed. The whole effort was a fine example of carefully worked-out and well-executed coordination of the latent abilities of the Company's personnel.

A partial-payment plan was part of the arrangements, the initial payment being $5 and monthly installments $5 per share. Interest at 6 per cent is paid on installments. Actual stock certificates are issued quarterly on the dividend date, a check being issued for interest and accumulated dividends.

Arkansas Valley Railway, Light & Power Company, Pueblo, Colo.

A feature of the development of the customer ownership plan by the Arkansas Valley Railway, Light & Power Company is the fact that the sales were made both directly by the Company and by a leading bond dealer. Since the work was started in September, 1917, $535,900 of the Company's 7 per cent preferred stock has been placed among 1025 residents of Pueblo and the twenty surrounding cities and towns served by the Company. The Company, without a special securities sales department, sold 71 per cent of the stock and 76 per cent of the new shareholders. All of the advertising, circularizing, etc., was done by the Company, this advertising referring the reader both to the Company and to the bond dealer, designated as fiscal agent. The latter also handles a considerable quantity of the Company's bonds and notes.

The success of this Company's endeavor has been due largely to the vigorous and sustained cooperation of all departments. Twenty per cent of the sales and 10 per cent of the stock were disposed of by the Commercial Department, but all department heads, district superintendents and a number of other employees made sales. A commission of 2 per cent was paid. About 16 per cent of the total stock sold was on the partial-payment basis. When this movement was initiated the local newspapers extended cordial cooperation both in their news and editorial columns. The total cost of selling has been about $5 a share.

ROCHESTER RAILWAY & LIGHT COMPANY, ROCHESTER, N. Y.

The Rochester Railway & Light Company sold $1,000,000 of its 7 per cent preferred stock direct to 1520 residents in 1918. The campaign method was employed, and no special securities department or securities salesmen were utilized. The selling cost per share, including every item of expense, printing of stock certificates, revenue stamps, tax, etc., was $2.96. Of the total amount of stock sold, $826,000 was disposed of for cash and $173,000 on partial payments.

Newspaper advertising was the largest single item of expense, amounting to $1.40 per share. Advertising in magazines, street cars, etc., amounted to $.326 per share. A commission of $.50 a share was allowed to all employees, except officers appointed by the board, on all signed subscriptions brought in. The sale was in direct charge of the vice-president and treasurer. Before the campaign every banker and broker in Rochester were interviewed and permission secured to use their names in advertising. They "boosted" the securities from every standpoint and were allowed a commission of $1.00 per share on all sales. The collective sales of the brokers, however, amounted to less than 30 shares.

Three hundred dollars in cash prizes were offered to employees, as follows: $100 first cash prize for the largest number of subscriptions received by one employee; $50 for the second largest number; $100 for the largest amount received in subscriptions by one employee and $50 for the second. The same man won the two first prizes by his zeal in following up prospects outside of business hours. Two salesmen for the Commercial Department were used to close prospects whom other employees found difficult and to follow up special leads. "We do not depend upon any specific source for the production of inquiries," says the management. "We advertised, developed prospects, found that shareholders exhibiting dividend checks brought subscriptions, and used every legitimate, dignified method of appealing to the different characteristics of the people as they might appear. People in every walk of life were subscribers. We had Pullman car porters, clergymen, bartenders, barbers, policemen, bankers, hundreds of women—all expressing through their subscriptions absolute confidence in the security."

The management does not believe that a special securities department is at all necessary to make a success of this work.

Stock is sold on the installment plan to the public at the rate of $10 per month per share; to employees at $5 per month per share. Interest at 7 per cent is allowed on payments regardless of whether they are carried through to completion or the amounts withdrawn.

An analysis of expense submitted by the Company is particularly interesting, as follows:

Sale of 10,000 *Shares of 7 Per Cent Preferred Stock.*

	Amount.	Per Share.
Salaries per pay rolls	$ 2,784.48	$0.278
Commissions	2,717.00	.271
Prizes for largest sale	300.00	.030
Advertising—newspapers	14,018.26	1.401
Advertising—magazines, street cars, etc.	3,266.36	.326
Automobile expense	628.50	.062
Printing circulars	1,355.06	.135
Printing Gas and Electric News	2,936.50	.293
Revenue stamps and tax	343.90	.034
Printing stock certificates	1,100.00	.110
Miscellaneous stationery and expense	506.32	.056
Total Feb. 28, 1919	$29,956.38	$2.996

The management says: "Please consider in the foregoing amount of $29,956.38 that we laid the foundation for a brand new financial policy. Probably one-half of this amount will cover the future campaigning, commissions, etc. Please note that $2,000 of this amount—the last three items—is for expenses which in no way could be construed as expenses of selling as they would obtain in any form of security.

Electric Bond and Share Company

Eight of the companies under the direction of the Electric Bond and Share Company are selling their preferred stocks direct to customers and resident citizens. Effort was begun in August, 1917, and has been carried on continuously since then, with the exception of the periods during which Liberty Loan subscriptions were solicited. Up to April 24, 1919, $1,698,500 of preferred stock had been distributed among the local publics, there having been 3,454 sales.

These companies sell both for cash and upon the partial payment plan, the purchase price of the stock in both instances being the same. The partial payment plan provides for the payment of 10 per cent monthly. Partial payment subscribers receive interest upon their payments and have the right to withdraw all payments prior to the date of final payment, including the interest thereon.

Meetings of all employees are held at various times and all are requested to participate in the selling of the preferred stock. Experience has been that the Commercial Departments have done very effective work, but other departments have also contributed substantially to the success achieved. A small commission is offered to all employees making sales. It is the intention of the organization to continue selling preferred stock locally indefinitely, and the plan will be extended to all the companies under Electric Bond and Share Company management as soon as possible.

Buffalo General Electric Company, Buffalo, N. Y.

While the Buffalo General Electric Company does not sell securities direct to its customers, it has worked out an effective form of cooperation with an investment banking house, which has placed $1,000,000 of 6 per cent convertible debentures among 450 residents. The investment banking house was supplied with a list of the Company's customers, which it circularized under its own name to excellent advantage.

Iowa Gas & Electric Company, Washington, Iowa.

Since January 1, 1917, the Iowa Gas & Electric Company has distributed $109,000 of its preferred stock among 160 residents, the personal selling being done by the president and manager and office employees. No special salesman has been used. The effort was launched with newspaper advertising, and once a year a circular letter is sent to all customers. On dividend dates letters regarding the stock, the Company and its affairs, etc., are enclosed with checks. In one case a transmission line was financed through stock sales to the people to be served. A commission of $2.00 per share is paid to the bankers; none to employees.

H. F. Derbyshire, general manager, says: "In smaller communities, where the Company management is generally known, the managers can sell stock where the average commercial man cannot. The smaller the community the more the people want to deal with those in authority, and we find this has been the general rule with us."

Ohio Service Company, Coshocton, Ohio.

The Ohio Service Company, which serves Coshocton and more than twenty other communities, has acquired 231 home shareholders within the past year, the average holdings being a trifle more than 4 shares of the company's 6 per cent preferred stock. The work has been carried out under the personal supervision of the manager without creating a special securities sales department. Commercial salesmen, superintendents and men from outside the organization have been utilized in the sales work.

Newspaper advertising, circular letters and pamphlets have been used extensively to develop prospects and prepare the way for the company's representatives. It has been found that commercial salesmen require much special instruction in order to sell stock successfully. Commission paid to employees, $2.00 a share; to outside agents, $3.50 per share. Total sales cost per share about $5.00. A well-developed partial payment plan was placed in effect, a little more than 10 per cent of the stock being sold in this way. Outside agents include young lawyers, secretaries of chambers of commerce, etc.

Mahoning & Shenango Railway & Light Company, Youngstown, Ohio

This company, operating in Youngstown, Ohio, and surrounding territory, has succeeded in selling its 7 per cent preferred stock locally under extremely adverse conditions, including controversies over increased rates and street railway fares. Since November, 1917, it has distributed nearly $500,000 of the preferred stock among about 800 residents.

The work has been carried on principally under the direction of the assistant manager of light and power. A separate department was organized for the purpose, the duties of this department including the keeping of books and records, general statistics, insurance and real estate records, etc. The sales force was recruited from the organization, several men being taken from the New Business Department. Besides the manager of the department and an office man an average of three salesmen are employed. Some of the salesmen work on a straight commission of $4 a share; others on drawing account and commission basis. Salesmen employed from outside the organization have had little success. Bankers, employees and others who suggest prospects receive $2 a share commission. The partial-payment plan is similar to those used by other companies. The management believes that stock sales can be handled best by a separate department devoted to the purpose.

Dayton Power and Light Company, Dayton, Ohio

The Dayton Power and Light Company furnishes the only example, so far as known, wherein the local sale of stock has been turned over exclusively to the Commercial Department. This department required but a short time to place $135,500 par value of 6 per cent preferred stock among a considerable number of residents. The campaign was started June 1, 1918. Total cost of selling, including advertising, salesmen's regular salaries and issuing and transferring stock, was $1.25 a share. No commissions were paid. Advertising was depended upon to produce inquiries. Partial-payment plan called for $10 per share initial payment and $15 per share per month. About 10 per cent of the stock was sold on the partial-payment basis.

Milwaukee Electric Railway & Light Company, Milwaukee, Wisconsin

This Company, together with other companies constituting the subsidiaries of the Wisconsin Edison Company, believes in the distribution of its securities among the public served by the companies, and sells such securities directly to the public. The organization accomplishes the work mainly by advertising, supplemented by personal solicitation, and utilizes the commercial sales organization only as an auxiliary and not as a primary effort. The company inaugurated the practice in 1916 and has sold the following securities:

7 % 5-year secured gold notes......	$1,820,000
7 % preferred stock...............	425,000
6½% 5-year secured gold notes......	300,000
5 % first mortgage gold bonds......	92,800

APPENDIX B

REPORT OF COMMITTEE ON THE SALE OF COMPANY SECURITIES TO CUSTOMERS AND RESIDENT CITIZENS

Views Regarding Selling Organization

The diverse views as to the best methods of security selling organizations are reflected in the following expressions:

Mr. A. F. Hockenbeamer, second vice-president and treasurer of the Pacific Gas & Electric Company, following nearly five years' experience in the sale of $8,359,300 preferred stock to the local public, says: "There is no doubt in my mind that the salesmen in central station Commercial Departments can be made a highly effective means of selling securities to customers. I would not, however, exclude other branches of the service. In our campaigns men and women in all branches have done effective work in establishing contacts between customers and our Stock Sales Department or other offices authorized to receive subscriptions. There may be some danger also in lessening the efficiency of a commercial organization by requiring it to divide its efforts along two totally distinct lines, and after all I believe every employee should utilize the opportunities to discover prospects that may come to him in the performance of his daily routine and without requiring any great departure from this routine. It is advertising that really creates the demand, and my view of the function of employees is that they are merely agencies for bringing prospects and the Stock Sales Department in contact with each other. If, however, employees are expected to go out and actually close trades, they should first be educated. Court decisions have quite definitely given means of redress to purchasers of securities bought on misrepresentation or misstatement of facts, and my feeling is we must be careful in the selection of employees to whom actual sales are entrusted. This in turn presupposes a course of instruction that will enable employees selected for this work to answer questions correctly and intelligently."

An officer of the Rochester Railway and Light Company says:

"I do not think it is at all necessary to organize a separate department. I should rather have the eleven hundred employees of the company, zealous to get their commissions, learning every detail of the Company's financing and spreading the propaganda in their various fields. This is worth as much to us as selling the stock."

After the sale of $3,000,000 of the Company's common stock to nearly 2000 employees and residents, Mr. A. N. Kemp, comptroller of the Southern California Edison Company, says:

"I am of the opinion that where a public utility desires to place its stock direct with its consumers and the general public it serves it should not have salesmen or other employees who are doing certain work also try to sell the company's securities as a side issue, nor should brokers be allowed to peddle the stock. The proper selling of securities needs as much training, if not more, than selling any other commodity, for the reason that the average consumer of a power company who has $1,000 or $2,000 on hand to invest, representing hard-earned savings, is not going to invest those savings on the strength of a short talk given by some power or light salesman, after interviewing him on other business.

"However, when such a man as the company's district agent or some similar local representative known to the consumers and the public interviews a prospective purchaser, the purchaser has confidence in such a man and will accept his statements as to the worth and stability of the securities almost without question.

"In any large city that is served by a public utility, it might be advisable to take one of the salesmen of the company who knows the properties thoroughly and give him a good grounding in the value of the securities that are to be sold, and of financial matters in general, so that the many inquiries which come into the main office in that particular city can be taken care of by someone who is devoting his whole time to the work. The city salesman should be of heavy enough calibre to be able to interview the big business men of that city."

Mr. Percy H. Whiting, advertising manager of the Central Maine Power Company, says:

"I should doubt if commercial representatives could profitably make a regular practise of spending part of their time on stock selling. It is hard to flop from one job to another. Of course, in a contest such as we run, any one man spends only a comparatively short time on stock selling: When our commercial representatives go in for stock selling they drop their other work. I think our plan of developing stock salesmen from our own force, when possible, and of paying some stimulative quota-and-bonus plan works out fairly well. I think that any fairly good salesman, given a fair training, can sell a good security if he can work after the field has been prepared by good direct and newspaper advertising."

Mr. A. C. Hall, secretary of the Southern Illinois Light and Power Company, which has upwards of 400 home shareholders among the 65 communities served by the organization, says:

"I doubt the suitability of regular commercial department representatives for work of this character, as the selling of preferred stock is a work requiring the service of a specialist. Compensation should be on a commission basis, as that naturally gives the proper incentive."

Mr. C. H. Howell, manager The Ohio Service Company, Coshocton, Ohio, says: "In our judgment this movement of distributing public utility securities among customers is one of the greatest movements inaugurated as a solution ultimately to the problem of municipal ownership. We have not allowed our stock to be distributed to our customers and friends by stock salesmen or stock brokers, but choose, first of all, the representations of our own men who are trained to deal with the public utility customers, bearing in mind that the sale of a few shares of stock is not by any means the whole end to be gained. We have already begun to feel the good effects of distributing our stock among our customers, and it is our intention to continue this work indefinitely. I plan to educate intensively a few of our commercial representatives as a sort of combination stock salesmen and public policy men to devote their time exclusively to the sale of securities. Much is to be gained in a public policy way aside from the actual raising of money by sale of securities."

The Mahoning and Shenango Railway and Light Company is of the opinion that any company which has a security of merit to offer should offer it and can sell it to its own home folks. "It is extremely unlikely," it says, "that any company could be operating under more difficult conditions than we have had during the past two years, and if we have been in any measure successful other companies can certainly do as well. Our suggestion in forming a separate department to take care of the work would be to select somebody in the organization who seems to have sales and organizing ability and faith and confidence in his company and put him at the head of the department and allow him to build up a sales force, using wherever possible men or women already in the employ of the company. A straight commission proposition is undoubtedly the best thing for the company and for the salesman if he has confidence in himself."

Mr. O. H. Hutchings, associate general manager of the Dayton Power and Light Company, the only company which has sold stock locally exclusively through its commercial department, says:

"We are heartily in favor of public service corporations selling their securities to their customers and believe that this is work that should be undertaken by the men in the Commercial Department, although we appreciate that all employees can be a big factor in the success of the sale of stock to customers. We believe that the commercial representatives should sell the securities in the same territory in which they are expected to obtain the regular light and power business, and that they should be compensated as they are for light and power business; that is, if they are paid on a salary basis no extra remuneration should be made, but if on a commission basis, some plan should be worked out along the same lines as the regular commission scheme."

Mr. E. F. Stone, superintendent of the Lighting, Power and Sales Department of the Arkansas Valley Railway, Light and Power Company, Pueblo, Colo: "There are many advantages in handling the sale of securities through the Commercial Department representatives. It has a tendency to broaden the salesmen and enable them to leave a better impression with customers, due to being in position to converse with them on any subject pertaining to the company's affairs. It is an advantage to the salesmen to become familiar with the operating statistics and financial condition of the company. The work gives them a diversity from the constant grind of the sale of service and merchandise, and this, in my opinion, makes them better salesmen for both securities and their ordinary line.

"In order for the representatives of the Commercial Department to be successful in the sale of securities they must be properly instructed. It is necessary to hold periodic meetings, to exchange ideas, to discuss unusual questions propounded to them and to receive direction and advice. One feature of customer ownership, as we understand it, is to make shareholders of the wage earners and people of small means. This necessitates taking small orders upon which as much time may be spent as on a large order. It is difficult for a security salesman to sell enough stock in small orders for him to earn a living income. The commercial salesman, however, can frequently pick up orders of this kind both to the advantage of himself and his company.

"The Commercial Department in any company should be a valuable factor in the sale of securities. I believe, however, that it would be well for a specialized securities sales force to be given the field periodically to work among the bankers and larger investors and incidentally to stimulate the local sales force with new ideas of salesmanship."

THE ELECTRO-CHEMICAL INDUSTRIES

By Joseph W. Richards*

I deem it a great opportunity to be able to speak to you about electro-chemistry, and as the Secretary of the American Electro-Chemical Society I cannot escape the suspicion that in accepting this invitation I may have been doing something to forward the interests of that Society. However, that is incidental; my chief purpose is to give a bird's-eye view of what electro-chemistry is and in what fields it is working, and somewhat of a survey of the electro-chemical industry.

Electrochemical Industries

- Electrolytic
  - Electrolysis of
    - Solutions
    - Fused Salts
- Electrothermal
  - Arc Processes
  - Resistance Furnaces

I will speak first of the general field of the electro-chemical industry. The chemical industries deal with the problem of taking the raw materials of nature and making them more valuable. I will give you an illustration: Take common salt, which costs about $2 a ton as it is taken out of the mine; and we convert it into caustic soda and chlorine, about half a ton of each, which are together worth $45 or $50. Take common water, and we convert it into hydrogen and oxygen; each of which has a considerable commercial value. Take the air, oxygen and nitrogen, and by means of electrical arc processes we cause the oxygen and nitrogen to combine to nitric acid.

These are samples taken at random of how the raw materials of nature are converted by chemical operations into more valuable materials for commercial use.

Metallurgy is one of the branches of applied chemistry. The function of the metallurgist is to take ores in which the metals occur in nature and extract from them the metals so that they may be usefully applied. When in the course of metallurgical opera-

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Presented at Fourth General and Executive Session.

tions you use electrical current, either for its electrolytic or its electro-thermal power, you have an electro-metallurgical operation. As illustrations of this, it is possible, and in some few countries profitable, at the present time, to make pig iron from iron ore by means of the electric furnace. It is almost everywhere profitable to refine impure copper into pure copper by means of an electrolytic operation.

We may therefore say in general that electro-chemistry deals with using electric energy to convert the raw materials of nature into more valuable materials, such as extracting metals from the ores, refining the metals, and similar operations which render them of increased value.

The electro-chemical industries may be divided into two broad classes, according to the way in which you use the electric current—we will divide them into: I: Electrolytic Processes. II: Electro-Thermal Processes.

The difference between these is this—if you send a direct current through a liquid, you can decompose it; the electric current is an extremely active and powerful chemical decomposing agent. If you have the conditions right, and send a current through an anode to a cathode, through an electrolyte, you can split the compound up into its constituents. There is no chemical compound that cannot be split up by the electric current; in fact, the electric current is so powerful that it requires less than ten volts to break up the strongest chemical compound known. Thus an insignificant direct current voltage is practically able to perform the strongest chemical operations and to decompose the strongest chemical compounds.

Therefore, electrolysis puts into the hands of the chemist an extremely strong agent, very frequently a simple agent, by which he can break a compound into its constituents in a way which he cannot do by any ordinary chemical operation. This principle is the basis of a large part of the electro-chemical industries. In such cases the operation requires very little voltage, as I have said, but the output of the operation is proportional to the number of amperes that go through the cell; it is not proportional to the energy employed.

The amperes of current flowing through the electrolyte determine how much of the compound is decomposed and how much of its constituents will be liberated, so that you have an entirely different basis for calculation from what you have with ordinary electrical questions, where the energy of the electric current is the chief factor. The output is proportional to the amperes which flow through, if you get anywhere near 100 per cent ampere efficiency.

Speaking broadly of the second class, the electro-thermal class is made up of those operations in which we use the electric current solely, or principally, for its heating effect; that is, it is used as a heating agent. The advantages which the electric current gives us in that respect are these: first, you have a heating agent which is absolutely under your control; second, you can generate the heat almost exactly where you want it, and utilize it at high efficiency. If you want to heat substances by ordinary means, coal or gas, it is very seldom that you obtain more than 10 to 20 per cent efficiency in heating. The maximum efficiency of heating that I know of in metallurgical operations, using fuel, is in melting pig iron in a foundry cupola; the maximum efficiency of heating there obtained is about 35 per cent. In melting steel in a crucible the efficiency is about 2 per cent. Between those extremes you have the ordinary efficiencies of applying the heat generated by coal and gas. But electrical heat is generated so much under your control, just where you want it, that you *start* with efficiencies of about 35 per cent and run up to efficiencies of nearly 90 per cent of the energy of the current actually usefully utilized, averaging between 50 and 75 per cent. It is because of that very high efficiency of utilization of electrical heat that it is possible to use electricity in these electro-thermal operations, because electrically generated heat, except under very unusual circumstances, costs a great deal more than the same amount of heat generated by means of fuel.

There are only a few places in the world where electrical heat is cheaper than fuel heat, such, for instance, as parts of Norway, where electric current can be purchased at $7.50 per horsepower-year, or $10 a kilowatt-year, and where coal costs from $15 to $20 a ton. Under such conditions you can heat your house by means of electrically generated heat cheaper than you can by coal. Those are exceptional conditions, but ordinarily electrical heat is commercial only by reason of the greater efficiency at which we apply it.

We will now briefly classify the electrolytic industries: what are they and what is their extent?

The original electrolytic industry is electro-plating. In electro-plating operations you have a slab of pure metal which you use as an anode put opposite the object to be plated in an electrolyte which contains the metal which you are to deposit as a plating, and passing the current you plate it with the metal from the solution. This is a large industry, as you know. Think of the extent of the gold and silver plating industries and the nickel plating industry. These industries are nearly one hundred years old. Silver and gold plating was first done with batteries, before the dynamo was invented. Since the invention of the dynamo these industries have extended their operations very greatly.

These industries are very largely distributed throughout the country. The usual small electro-plating plants consume small amounts of power, but there are some large electro-plating plants which use up considerable electric energy.

As far as concerns central station power plants, almost all of these electro-plating plants run on one shift of ten hours a day, and therefore they do not require power continuously. It can be arranged with them to take the power mostly in the "off-peak" hours; when they wish to work overtime it should be done after midnight, in the early morning hours, instead of before midnight.

Besides plating for simply decorative purposes plating is done for commercial purposes; for instance, electro-galvanizing, that is, the electro-plating of zinc. You are familiar with the electro-zinc plated conduits used in commercial wiring. That is a use of zinc plating to put a covering on these conduits to prevent corrosion. Such plants are, in general, run on a somewhat large scale, and consume more power than those which merely do plating for decorative purposes.

Out of the electrolytic plating industries grew the electro-refining metal industries, which are commercially of much more importance and consume a great deal more power. The electro-platers used a nearly pure metal anode to renew the bath, but if the anode was impure there was a residue of impurities left in the bottom of the bath. The Elkington Brothers in England were plating copper, and they observed that the impurities in the copper, particularly the silver and gold, fell down as mud in the bottom of the bath. Then the thought came to them: Why not use this method of plating metal from anode to cathode as a method of refining it? From this arose the electrolytic metal refining industries. These are all based on the principle of taking as anode the impure metal you want to refine, putting it in a solution of salt that contains the metal, passing direct current through the bath, depositing it as pretty nearly pure metal on the cathode, and leaving the bulk of the impurities as mud or unattacked residue to fall to the bottom of the bath. Some of the impurities will go into solution, such as nickel, zinc and iron, but when using a copper anode the platinum, silver and gold stay in the mud, and are completely recovered, while pure copper only deposits at the cathode. That is the principle which lies at the foundation of the electrolytic refining of copper.

The same principle has been applied to the electrolytic refining of silver, gold, lead, zinc, tin and several other metals, but that of copper is the principal one. Over 90 per cent of all the copper made is put through the electrolytic refineries. There is one refinery near New York, for instance, that refines over five hundred tons of copper in a day when in full operation. This is about $150,000 worth of copper a day, in one refinery. The question of the supply of power to such an industry is very important. The power required in such large plants runs into the thousands of kilowatts, but as far as central station men are concerned, that power is usually considered as constant for twenty-four hours a day, and it has a 100 per cent load factor.

I wish to state, however, that I do not think that the electrochemists—I mean particularly the men running such electrolytic refining industries, have worked out as far as can be done the possibility of running for certain hours a day on reduced power. In many plants where the current is now steadily used for twenty-four hours a day it would be quite possible, in my opinion, to reduce the current materially for a few hours a day, without any damage to the product except reduced output. If you do that, your overhead expenses go on just the same, and it therefore costs money to do it, but you must balance the loss against the gain. It is a question for the central stations to decide whether they can make great reductions if they furnish the current fully during, say, twenty hours a day, and say for four hours a day at two-thirds to one-third the full current, in order to keep the operation running. Metallurgically, I see no reason why it cannot be done, but it is entirely a question of balancing financially the advantages against the disadvantages.

I know of a very large copper refining plant which, before it put up its own power plant, tried to make arrangements with the local city power company to secure the power needed on the basis of reducing the amount of power which it would take at certain hours. The arrangement fell through, because the parties concerned did not thoroughly understand each other, and did not go quite to the bottom of the proposition, analyzing the problem, and getting into their minds exactly the differences which would be caused by the proposed arrangement. I know that the electrochemists were anxious to make the arrangement with the power company, but I think there were faults on both sides; each side did not go to the bottom of the problem in the manner it should have done.

Next in line to these electrolytic refining processes are those which *extract* metal from a compound. There are opportunities of using the electrolytic power of the current in getting the metal from its ores, and these methods are being rapidly extended at the present time. One of them, which you will understand very easily, is, for instance, in the extraction of copper from its ores. Most of the ores of copper are insoluble in water, but you can dissolve them in acid. There is a large mine in Chile, in which the ore is easily soluble in dilute sulphuric acid. The ore is crushed and placed in vats holding about one thousand tons at a time, and leached with sulphuric acid. This brings the copper into solution. Then the solution of sulphate of copper is taken to decomposing tanks, and you have unattackable anodes—a sheet of lead with 4 per cent antimony does very well—and pass a current through. Then the current takes the metal out of the solution, extracts it in a pure state, deposits it on the cathode as pure copper, and leaves in solution sulphuric acid. The solution is then ready to go back to the tanks and take up some more copper, so that the acid is used over and over again. Oxygen gas is liberated at the lead anode, which lasts many months.

That sounds almost too easy to be true, but it is true. The Chile Copper Company is working it on a scale of 10,000 tons of copper ore a day, and it is probably making copper by that method cheaper than any other copper-producing works in the world. This is a much simpler and cheaper operation than any other that could be applied to the handling of that ore.

The same principle, slightly modified, has been applied to the extraction of zinc. Within the last five years large plants have been put up in this country and abroad for the electrolytic extraction of zinc. The chief ore of zinc is zinc sulphide, which is insoluble in water, but if you roast it carefully you can convert part of the zinc sulphide into zinc sulphate which is soluble in water, and leave part as zinc oxide. You take the zinc sulphate solution, pass it through the electrolytic cell, deposit zinc, and leave the sulphuric acid. That sulphuric acid can be used to leach the residue of the ore which contains zinc oxide, and will dissolve out the rest of the zinc. The solution is electrolyzed for its zinc like the first solution. Plants to treat zinc in that way have been put up on a great scale. At Great Falls, Montana, a plant with a capacity of 200 tons of zinc a day has been erected. Several million dollars were put into it, but the price of high-grade zinc went so high during the war that the plant was paying for itself every few months it was in operation. Electrolytic zinc is far purer than the ordinary zinc made in retorts, and is so pure you can use it in making the finest quality of brass for cartridges, whereas most zinc is not fit for making that quality of brass. It runs 99.98 pure and commands a higher price than ordinary retort zinc.

This industry is rapidly extending. I am speaking of industries that have but recently been put in operation. This electrolytic extraction of copper from its ore by the use of electric current, and the electrolytic production of zinc are at the present time rapidly extending, so that you will read more and more about them in the transactions of the societies which interest themselves in electro-chemical processes.

Gold is another example of a metal which can be extracted from its ore in this way. You can take a gold ore, treat it with a potassium cyanide solution, which dissolves out the gold, and then precipitate the gold from the solution by means of electric current. Gold and silver can both be extracted in that way.

Another variety of the electrolytic processes is the conversion of cheap salt into more valuable chemical products. I am not speaking now of extracting metals, but of converting one compound into the other—general chemical processes. I have already mentioned salt. There has grown up a large industry for the manufacture of caustic soda and chlorine. Many works are devoted to this industry, with millions of dollars of capital invested, and they menace very seriously the older chemical plants, which work on the non-electric method and which represent an investment of probably $100,000,000. These plants are springing up in various places, particularly where they have cheap salt, like in Central New York, near Detroit, in West Virginia, and other places.

We take the salt, dissolve it, and pass through a direct current, getting out at the anode chlorine. This chlorine is piped off, and you all know the very many uses of chlorine gas. It has helped very materially in the winning of the war. The uses of chlorine are only beginning to be touched. There will be probably five or ten times as much used in the near future as is being used now, because of the extension of the uses of chlorine in all sorts of industries, the purification of drinking water, sterilization of sewage, disinfection, etc.

At the cathode you obtain a caustic soda which can be converted into carbonate of soda by a simple chemical operation, and so you have the caustic soda industry and the carbonate of soda industry, directly following from the electrolyzing of common salt by the electrolytic method.

I will merely mention some of the other processes of a similar nature which have grown up from the electrolyzing of salt to produce more valuable salts. If you electrolyze common salt solution under different conditions, you can get sodium hypochlorite, a valuable bleach used in the cotton, textile, and paper industries. Electrolyzing it again under a little different condition you convert it into sodium chlorate; all the chlorate used on matches is made in that way. Electrolyzing it under still different conditions, you get sodium per-chlorate, which is extremely valuable for its antiseptic and oxidyzing qualities. Other salts, such as permanganates, per-borates, per-carbonates, per-sulphates, are made by similar processes. These are all methods of converting a cheap solution of a cheap salt into a much more valuable product, which has a great variety of uses.

The iodoform which is at the present time used so much in medicine is, I believe, made electro-chemically, from a solution of potassium iodide and iodine in the presence of alcohol.

Another application of the electrolytic method, used somewhat differently, is the production of gases. You can electrolyze water which contains some sulphuric acid or a little caustic soda and produce hydrogen and oxygen. Many plants have been erected in different parts of the country to get hydrogen and oxygen for blow-pipe work, and in general for various chemical operations. Ozone can be made in the same way by a little variation of the process. Chlorine is made as a by-product of the caustic soda industry, and is made in extremely large amounts. The sterilization of water and sewage can be achieved by electrolyzing them in the presence of a small amount of sodium chloride, and when the chlorine is generated it entirely sterilizes them. These methods are being extended rapidly.

There are other electrolytic operations where you pass a current through a fused salt, usually around redness. If you melt and electrolyze sodium chloride under correct conditions, you get chlorine at one pole and sodium at the other—metallic sodium. Metallic sodium, which is high priced, is obtained directly, with chlorine as a by-product. On the other hand, aluminium, which is now made in such tremendous quantities, is made by electrolyzing a huge bath in which alumina is dissolved—the oxide of aluminium. It is dissolved in a salt called cryolite, which melts at a bright red heat. You pass the current through the melt and get oxygen at the anodes (burning them to carbon monoxide) and aluminium at the cathode.

That is the way in which all aluminium is made. This process has reduced the cost of making aluminium from about $2.50 a pound to less than 15 cents a pound.

The size of the aluminium industry is indicated by the fact that there are probably four hundred thousand horsepower at work in the United States making aluminium at the present time, and the chief company which is making it is developing a water power of 400,000 horsepower more, in eastern Tennessee, in order to double its output.

These processes I have just spoken of are essentially continuous, twenty-four-hour processes. When you have to employ a current to melt the electrolyte, and to keep it melted by its own resistance, you cannot let up on the current more than a few minutes at a time, because any stoppage of current would allow the bath to freeze solid.

Sodium, calcium, magnesium and cerium are all produced by methods resembling that used for aluminium.

I have exhausted what I have to say about the electrolytic methods, and will now turn to the electro-thermal methods, giving a description of them as briefly as possible. I am now referring to the methods where the current is used solely for its heating effect. Many people who have not studied the question closely think that an electrical apparatus that is used for its heating effect must necessarily be run at a very high temperature. While it is true that you can get a higher temperature with an electric furnace than in any other way, you can also run an electric furnace at a low temperature or moderate temperature, and the range at which they are run has been cut down until we use them to melt ordinary metals, tin, zinc, brass, etc., as well as for melting steel, and also for temperatures which approximate the volatilizing point of carbon.

Let me say of the electro-thermal methods, in general, that in them you use the electric current for its heating effect, and when you are informed that the useful effect thus obtained is proportional to the amount of electrical *energy,* and not proportional to the amperes used, you see on what an entirely different basis from the electrolytic methods we are working. The product of volts by amperes represents the amount of electrical energy which has been absorbed, and you figure it out on that basis. High amperes and low volts, or high volts and low amperes—it does not make any difference as long as you get electrical energy into the furnace. In electric furnaces you can use alternating current or direct current, generally the former because it is cheaper and cannot have one-sided effects, but in electrolytic operations you must use direct current only.

We have two fundamental types of electric furnaces, the arc and the resistance. In an arc furnace the current jumps through a gap in the air in the furnace. There is a break in the circuit and therefore you have an arc. Speaking of the history of this process, experiments began a hundred years ago, using the battery and small carbon pencils. Now the electric pencils have grown to electrodes 24 inches in diameter and 7 feet long, and it is also interesting to note the growth which has taken place in the size of electric furnaces, and the scale on which they are operating. They have grown from little bits of experimental things in the laboratory to furnaces of fifteen thousand kilowatts as a maximum.

How can we use the electric arc for chemical operations? We can, as one simple method, bring the substance right into the arc and heat it nearly to the temperature of the arc. For example, pass air through it rapidly, and as it goes through and comes out again it is rapidly heated and cooled; part of the oxygen and nitrogen combine with each other, and there you have the basis of the process for the fixation of atmospheric nitrogen.

The commercial importance of this industry may be realized from the following instance: I have visited a mountain valley in Norway where ten years ago there were a few farms, with a big waterfall, some two thousand feet high, at the upper end of the valley. Two years later a town was there with ten thousand inhabitants, two power stations of 175,000 horsepower each and a large manufacturing plant, looking like an industrial town of Eastern France. That was in Central Norway, and the nitrate fertilizer there made was being shipped as far as the sugar plantations of Hawaii. That plant for the fixation of nitrogen of the air and production of nitric acid was built largely by German capital, because the Germans realized the importance of having an artificial method of making nitric acid. The method of making nitric acid developed there enabled Germany to keep in the war for four years, whereas otherwise she would not have been in the war over four months; it was their salvation when their supplies of nitrates from Chile were cut off. The war quickly exhausted their stock of nitrates, and they would have had to throw up their hands inside of six months if it had not been that they quickly put up in Germany numerous plants for the fixation of nitrogen and the production of nitric acid. At every place where a little power could be spared they put in a nitric acid plant, and it is estimated that they put in nearly five hundred thousand horsepower of these plants, and spent $100,000,000 inside of six months in putting up these plants, thus saving the nitric acid situation.

The arc furnaces used are built to a capacity of 2,000 kilowatts. The arc is spread out by means of magnets, so that it is a flat disc six feet in diameter, and they call it the "Electric Sun." The air is simply passed through the arc.

Another use of the arc furnace is by plain radiation from the arc to melt substances brought near to it; in other words, taking two electrodes, with a heavy arc between, bring the metals close to them, and melt them by heat radiated by the arc. The arc also radiates heat against the roof, and this is partly reflected back to the metal. These arc radiation furnaces, however, have been built up to 1,000 kilowatts, and metals can be melted in them by the ton. Steel furnaces up to six tons' capacity have been operated on this principle.

There is another kind of arc furnace, where the charge itself forms one pole of the arc. They are a little bit more complex in action. You may have, for instance, electrodes passing downward into a steel furnace, the bath of steel itself forming one other pole of the arc. The material is heated partly by resistance, but principally by the arc at its surface. There are hundreds of furnaces of that type in operation. We have several kinds in this country, but the principal one is the Heroult, in which three electrodes pass through the roof of the furnace and the current runs from one electrode to the bath underneath and then to the other electrode, using 3-phase current. The surface of the bath is kept hot principally by the arcs playing on it. Furnaces working on that principle are in operation up to a capacity of thirty tons. I was talking to a gentleman recently who was operating some of these furnaces, and he agreed that there is no reason why one should not build fifty-ton furnaces if it was desirable. Such a furnace would take 3,000 kilowatts.

The most important thing in the metallurgical field at the present time is the development of these electrical steel furnaces. It will not be long before all the steel made will be put through an electric furnace before it is finished. You can make in them steel which approximates or equals in quality crucible steel, but in the other processes, the Bessemer and open-hearth, you cannot duplicate the electric furnace product.

The U. S. Steel Corporation will be turning out 20,000 tons of electric steel a month in the near future, using the electric furnace to finish steel made first in the Bessemer converter, nearly finished in the open-hearth furnace, and given its finishing touches in the electric furnace.

In finishing steel in the electric furnace you can get it perfectly unoxidized, since air does not have an opportunity to get in; it is not needed. Whereas in a furnace heated by gas you must have gases passing through to heat it, and they spoil the quality of the steel. The electric furnace can be closed air tight, producing a steel comparable in quality to crucible steel, or anywhere in between the quality of open-hearth and crucible steel. The electric steel industry will increase very rapidly; it has increased in the United States in the last five years from about thirty furnaces making electric steel to two hundred and fifty or more. The steelmakers have been simply "falling over themselves" to put in electric furnaces.

Time is lacking to describe the resistance class of furnaces, wherein, like an incandescent filament, a large resistor converts the electric energy into heat. This resistor may be the substance itself being treated, or a solid resistor like a carbon rod, or a mass of granular carbon, the substance being heated by contact with or radiation from the resistor. This class includes the induction furnaces where the resistor is heated by a secondary induced current, such a furnace being really a transformer with a secondary of one turn. It includes the electric pig-iron furnace, which is commercially profitable in Norway and Sweden, also the various electric-heating furnaces of the Baily type, which are at present making a great stir in the steel industry.

I had a few pictures to show you to prove the reality of some of the things I have been talking about, but I have already consumed very nearly my allotted time, and can, therefore, mention only briefly a few other operations or processes which are of much commercial importance and which consume large amounts of power. For instance, we have the carborundum furnaces at

Niagara Falls. Carborundum cannot be made in any way except by the electric furnace. There are the ferro-alloy furnaces which produce the ferro-alloys, a wonderful series of molybdenum, chromium, vanadium and silicon alloys which are used in making the valuable alloy steels, of which you know the uses. That industry is growing rapidly and consumes large amounts of power. The calcium carbide industry alone uses nearly a million horsepower, but must be dismissed with mere mention.

We have also electrical heating furnaces not meant to melt metals but simply to heat them—a large variety of interesting furnaces. It will be but a short time before all the brass in this country will be melted by electric furnaces. It will not be long before most of the heat treatment of steel, that which is preliminary to hardening, tempering and annealing, will be done electrically.

You will notice that there are essentially two kinds of operations which I have spoken of: some are continuous and some are intermittent, and of the continuous processes, some are actually 100 per cent load factor. The discontinuous processes can be operated for a short time and then discontinued. There is a little steel furnace near my home that operates from twelve o'clock at night until four o'clock in the afternoon, and during peak hours it practically shuts off its current. Many of the continuous processes could, I am sure, operate on reduced current in "peak" hours, if it were made sufficiently attractive to them to do so by a special low-power rate.

I am forced to admit that the electro-chemist and the electrometallurgist have not studied their power problems as they should have done. They have not gotten together with the central station men on a broad basis of enlightened discussion. Perhaps there is blame on both sides. The electro-chemists have not studied out their questions thoroughly on the possibility of using intermittent power, like running a batch of steel, and still less thoroughly on some of the continuous operations where the power might be reduced for a few hours and brought up again. I think those are particularly the directions where electro-chemists have not fully realized the possibility of using central station power.

In conclusion, I believe the best hope central power stations have of raising their power factor and smoothing over the peaks and valleys of their load curve, lies in close cooperation with the electro-chemical and electro-metallurgical industries.

E. W. Lloyd, Chicago: It is peculiarly fortunate that we were able to listen to Prof. Richards this morning on a subject to which, to my mind, this Association has given altogether too little attention. The Electro-Chemical Society has assumed a very important position in relation to the electrical and electro-chemical industries of this country, and we have not associated ourselves with it to the extent we should have.

The tremendous amount of energy used by electro-metallurgical and electrolytic processes must have been a revelation to many people who listened to Prof. Richards. Some of us have given attention to the wonderful possibilities for the central station business in this field, and I am sure it will be very profitable for the members of this Association to pay more attention to this subject than they have up to this time. It may be that some of our members have felt that the concerns using these processes in their neighborhood are too small to make profitable the business of supplying power to them, but there are very many important factories of this class which are of sufficient importance to investigate and, if necessary, to spend considerable time and money to place on central station lines.

I cannot refrain from speaking quite earnestly about this subject, because it has been brought so closely to my attention, particularly in the last two years on account of what has transpired during the war. The manufacturers of these products need electric power, and the central station companies can bring about an arrangement with them which will yield a handsome revenue at profitable rates. I am convinced that there are a large number of products that can be manufactured by electricity at existing standard rates. There are certain electro-chemical products marketable at quite a high price per pound or ton, in the manufacture of which the cost of electricity is not, in my judgment, the most important factor. For instance, the melting of high-grade steels and alloys is accomplished by using so few kilowatt-hours per ton that the cost of electricity, as was brought out in the discussion in one of our Commercial Sessions yesterday, is not important.

Therefore, we should take the opportunity presented and brought to a focus by the war to get in closer touch with the American Electro-Chemical Society and bring about relations which will be profitable to both of us. As Prof. Richards has said, there have been misunderstandings, perhaps due to the lack of knowledge on the part of both the manufacturer of the electro-chemical or electro-thermo processes and the central station man, and the latter has neglected many opportunities for presenting the matter from the central station point of view to these manufacturers, which I hope he will now begin to do.

I think Prof. Richards presented a matter of epochal importance to this Association, and I move a vote of thanks to the Professor for bringing the matter to the attention of our membership by giving us the valuable information which he has on these important subjects.

(The motion was duly put to vote and carried.)

CONSTITUTION OF THE COMMERCIAL SECTION NATIONAL ELECTRIC LIGHT ASSOCIATION

Amended and Adopted at Thirty-ninth Convention, Chicago, Ill. May 26, 1916

ARTICLE I—NAME

This organization shall be entitled Commercial Section, National Electric Light Association.

ARTICLE II—OBJECT

The object of the Commercial Section shall be to aid in every way possible the development of the central station sale of electricity for light, heat, power and other uses, and to co-operate with allied agencies, such as electrical contractors and supply dealers, toward that end.

ARTICLE III—MEMBERSHIP

Class B and Class E members of the National Electric Light Association shall be eligible for membership.

Each such member is entitled to membership in one of the National Special Sections, as he may elect, or to membership in more than one upon payment of an additional fee for each additional section he may join.

ARTICLE IV—OFFICERS

Section 1.—The officers of the Commercial Section shall be a Chairman, two Vice-Chairmen, Secretary and an Executive Committee. The Treasurer of the Section shall be the Treasurer of the National Electric Light Association.

Section 2—The Chairman, two Vice-Chairmen, and Secretary shall be elected by the Section from Class B members of the existing Executive Committee. Each shall serve for one year from July 1st following his election, or until the election and qualification of his successor. The Chairman shall preside at all meetings of the Section and at the Executive Committtee meetings and shall perform such other duties as may be provided for in this Constitution, by vote of the Section or of the Executive Committee. The Chairman shall not be eligible for reelection until two years after his term has expired. The duties of the Vice-Chairmen and Secretary shall be those usually pertaining to such offices.

Should one of the Vice-Chairmen be called upon to fill out the unexpired term of the Chairman, this period shall not be construed as a term as provided in this article to prevent his election to the office of Chairman at the next succeeding election.

Section 3.—The Executive Committee shall consist of the Chairman, two Vice-Chairmen, retiring Chairman, the Secretary and thirteen other elected members. The Chairmen of the Bureaus, elected by their bodies, shall act as members of the Executive Committee for the term of their office.

At each annual meeting of the Section there shall be elected for a period of three years from the next succeeding July 1st, or until the election and qualification of their successors, four members of the Executive Committee or that number of members which, including the officers of the Section and the retiring Chairman, shall complete the total number of eighteen comprising the Executive Committee. The majority of the Executive Committee shall always consist of Class B members. The Chairman of the Section shall act as Chairman of the Committee.

Section 4.—The Executive Committee shall be the governing body of the Section; shall manage its affairs and pass upon all applications for membership, and upon the eligibility of representatives, subject to this Constitution and such special rules or regulations as may be adopted by the Section from time to time. A majority of the Committee shall constitute a quorum.

Article V—Dues

Article VII, Section 2, of the Constitution of the National Electric Light Association, states as follows:

"The annual dues of Class B members shall be $5, including membership in a Geographic Section and in a National Special Section."

Article VII, Section 5 of the Constitution applies the same provisions to Class E members.

Under these provisions membership in the Commercial Section is available without additional charge to all Class B and E members in good standing, except to those who are already members in another National Special Section, in which case the dues shall be $2.50 annually.

Article VI—Election of Officers

Section 1.—At an executive session of the Section, to be held on the second day of the annual convention, there shall be appointed by the Chairman of the Section a Nominating Committee, to be composed of five members of the Section. This Nominating Committee shall, at a subsequent executive session during that convention, bring in the names of those recommended by it for the several offices to be filled.

The submission of names by the Nominating Committee shall not, however, debar any five members from making nominations for any or all of the several offices to be filled, which nominations, if seconded, shall be submitted for election at the same time, and in the same manner as those of the Nominating Committee. Whenever there are more nominees than vacancies to be filled, then, in such cases, the election shall be decided by ballot. When there is no contest for office, the Secretary may be instructed by a *viva voce* vote to cast the ballot for those presented by the Nominating Committee.

Section 2.—Vacancies in office may be filled by the Executive Committee to cover the term ending July 1st after the next annual meeting of the Section when the unexpired terms shall be filled.

Section 3.—The Executive Committee shall be empowered to remove any of its members for failure to attend at least two consecutive Executive Committee meetings of the Section, or for any other good and sufficient cause; such removal to be brought up for the consideration of the Committee by the Chairman, or either of the Vice-Chairmen, or by the Chairman and one or both of the Vice-Chairmen jointly.

Article VII—Voting and Proxies

Section 1.—A roll call shall be ordered on the demand of ten members on any question before the Section.

Section 2.—Voting by proxy shall not be allowed at any meeting of the Section or at any meeting of its Executive Committee.

ARTICLE VIII—COMMITTEES

Section 1.—The Chairman shall name such committees as may seem to him desirable, subject to the approval of the Executive Committee, and he shall appoint the members thereof.

Section 2.—Unless otherwise provided, the terms of members of the committees shall expire with the end of the month of June next following their appointment, unless otherwise terminated by the Executive Committee.

ARTICLE IX—AMENDMENTS

Amendments to this Constitution shall be presented in writing to the Executive Committee, signed by at least ten members of the section, and shall be referred before being acted upon to a committee to be elected by the Section. A two-thirds vote of all members present at a regular convention meeting shall be necessary for their adoption.

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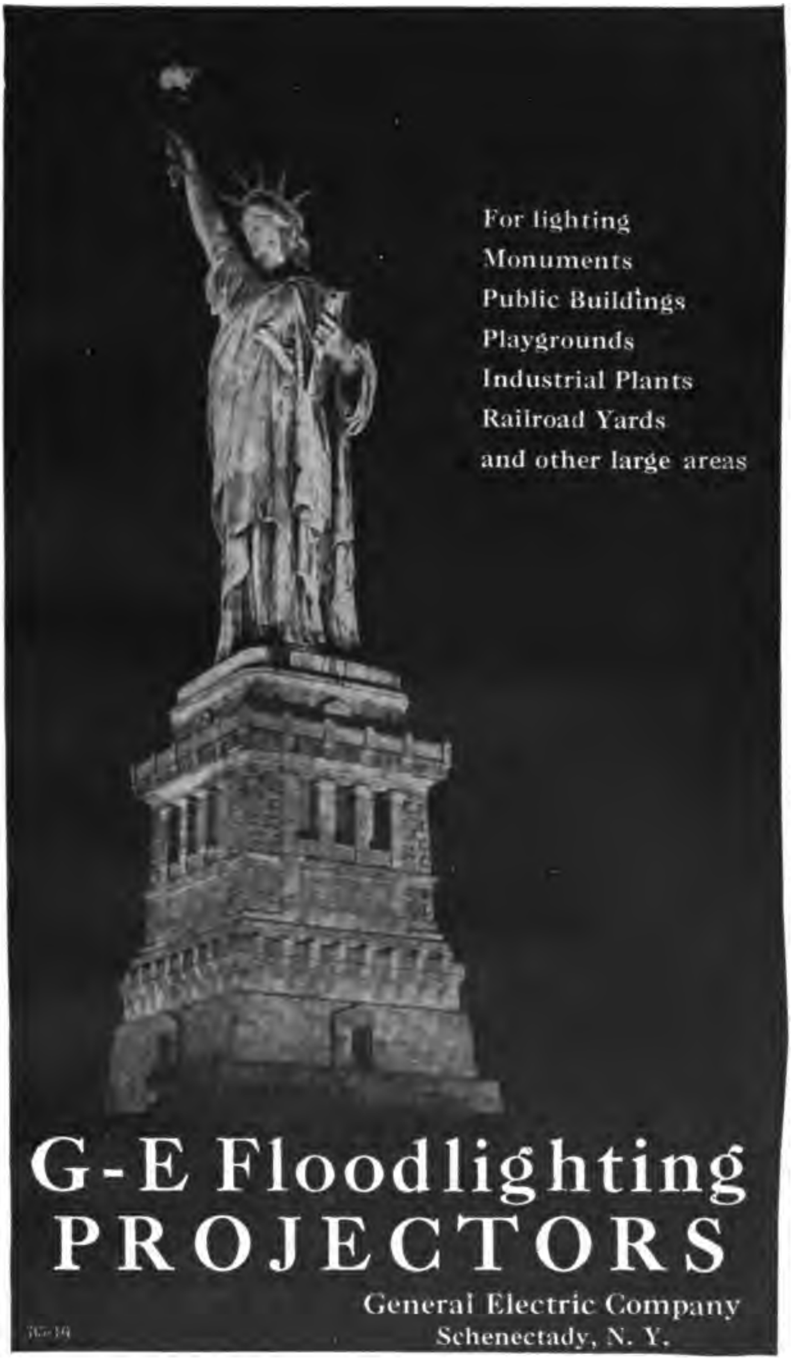
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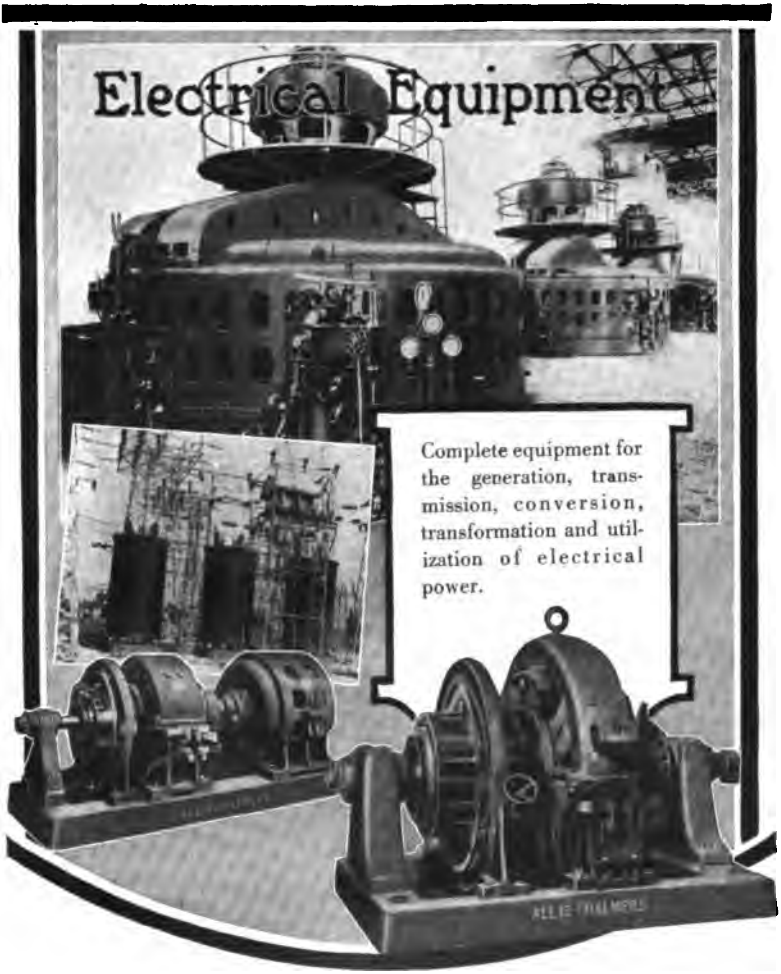

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